PB89-188742

Superfund Record of Decision (EPA Region 8) Broderick Wood Products Company, Adams County, Colorado (First Remedial Action), June 1988

(U.S.) Environmental Protection Agency, Washington, DC

30 Jun 88

U.S. Department of Commerce
National Technical Information Service

United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R08-88/021
June 1988

PB89-188742

EPA

Superfund Record of Decision:

Broderick Wood Products, CO

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL INFORMATION SERVICE
SPRINGFIELD, VA. 22161

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R08-88/021	2.

3. Recipient's Accession No. PB89 188742/AS

4. Title and Subtitle
SUPERFUND RECORD OF DECISION
Broderick Wood Products, CO
First Remedial Action

5. Report Date 06/30/88

6.

7. Author(s)

8. Performing Organization Rept. No.

9. Performing Organization Name and Address

10. Project/Task/Work Unit No.

11. Contract(C) or Grant(G) No.
(C)
(G)

12. Sponsoring Organization Name and Address
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

13. Type of Report & Period Covered
800/000

14.

15. Supplementary Notes

P

16. Abstract (Limit: 200 words)

The Broderick Wood Products Company (BWP) site, is located in Adams County, Colorado, and encompasses approximately 64 acres. It is situated in a primarily industrial area and is bounded on the southwest and southeast by railroad tracks and on the north by Fisher Ditch. The site is one-half mile south of Clear Creek, a perennial stream. The nearest residences are less than one-eighth mile north of the property line. Major site features include two surface impoundments and a total of 19 buildings and structures. Between 1947 and 1981, BWP operated a wood treatment facility to treat power poles, fence posts, railroad ties and other wood products. Process wastes from the plant were conveyed through a clay pipe to the two onsite, unlined surface impoundments, referred to as the main and secondary impoundments and located in the northwest corner of the facility. Records indicate that waste seepage was apparent just north of the site and became so extensive that the waste was burned off, starting in 1955. Records also indicate that four additional ponds periodically were utilized. In August 1980, BWP submitted a RCRA permitting application and obtained interim status to operate its facility but ceased operations in November 1981. Site investigations conducted by EPA in April 1981 and July 1982 noted several violations of RCRA requirements. Another site inspection in December 1982 revealed the possibility of serious contamination at a → P2
(See Attached Sheet)

17. Document Analysis a. Descriptors
Record of Decision
Broderick Wood Products, CO
First Remedial Action
Contaminated Media: gw, soil
Key Contaminants: metals (lead), organics (dioxins, PAHs, PCPs), VOCs (benzene)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

Availability Statement	19. Security Class (This Report) None	21. No. of Pages 112
	20. Security Class (This Page) None	22. Price / MF PC$21.95/$6.95

(See ANSI–Z39.18) See Instructions on Reverse

OPTIONAL FORM 272 (4–77)
(Formerly NTIS–35)
Department of Commerce

EPA/ROD/R08-88/021
Broderick Wood Products, CO
First Remedial Action

16. ABSTRACT (continued)

trench in the vicinity of the surface impoundments that reportedly had only been used for the disposal of solid waste. A black stain and oily puddle were noted at the bottom of the trench. Wood treating chemicals also were detected in a ground water monitoring well located immediately downgradient of the surface impoundments. A source of contamination at the site that will be addressed in this remedial action is a result of a fire in July 1985 that damaged the treatment plant building. Water used to fight the fire was contaminated with asbestos fibers from the building insulation. This contaminated water was pumped to onsite holding vessels and some still remains in the basement of the building. The main and secondary impoundments have been identified as the major sources of site contamination. The main impoundment contains a surface layer of oil and grease, a water layer, and a sludge layer. The secondary impoundment contains primarily a sludge layer. The quantity of sludge from the two impoundments is estimated to be approximately 4000 yd^3, and is designated as RCRA K001 hazardous waste. Approximately 31,000 yd^3 of contaminated soil is estimated to be below the impoundments. The primary contaminants of concern from the impoundments affecting the soil and ground water are VOCs including benzene, organics including PAHs, PCPs, dioxins, and metals including lead.

The selected remedial action for this site includes: installation of access restrictions; excavation and onsite mobile incineration of the sludge and oil in the main and the secondary impoundments, with offsite disposal of the residual ash; treatment of contaminated impoundment wastewater using carbon adsorption with disposal through onsite evapo-transpiration or use as incinerator quench water; excavation of the visibly contaminated soil beneath the impoundments, and onsite incineration if the volume is less than 2,500 yd^3, or onsite storage for further studies, if the volume is greater than 2,500 yd^3; filtration of water from the facility area to remove asbestos fibers, and treatment using carbon adsorption, with disposal through onsite evapo-transpiration or use as incineration quench water; and ground water monitoring. The estimated present worth cost for this remedial action ranges between $2,264,000 and $3,603,200.

SITE NAME AND LOCATION

Name: Broderick Wood Products Company
Location: Adams County, Colorado

STATEMENT OF PURPOSE AND BASIS

This decision document presents a selected remedial action for the Broderick Wood Products Superfund site in Adams County, Colorado. This document was developed according to the requirements of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, where appropriate, the National Contingency Plan (NCP, 40 CFR, Part 300).

This decision is based on an administrative record for the site. The administrative record includes documents describing the analysis of effectiveness and cost of the remedial alternatives for an interim remedy at the Broderick Wood Products site. Attached to this Record of Decision is an index to that administrative record.

The State of Colorado has been consulted on the selected remedy, and has not yet indicated whether or not it will concur on the remedy.

DESCRIPTION OF THE SELECTED REMEDY

The remedy that EPA has selected is an interim remedy (first operable unit) to address source control and the direct contact exposure pathway. The remedy consists of several components to control the major source of contamination at the site (the main and secondary impoundments), and to address near term risks from direct contact exposure to site contaminants. Future studies and remedies will address the downgradient contaminant plume and other contamination associated with the site.

The major components of the selected remedy and the concerns that they address include the following:

Concerns		Remedy
Site Access	-	Construct a security fence around the entire site; the fence will be six feet high with chain link, topped with three strands of barbed wire. Install 20 warning signs around the site.

Concerns	Remedy
Impoundment Contents	- Excavate and incinerate on-site the sludge and oil in the main and secondary impoundments; ash residues will be disposed in a hazardous waste landfill.
	- Treat contaminated impoundment waste water with a carbon adsorption treatment system; the treated water will either be used as incineration quench water or disposed of through on-site evapo-transpiration.
Soils Beneath Impoundments	- Excavate the visibly contaminated soils beneath the impoundments; these soils will either be incinerated on-site (if the volume is less than 2500 yd^3) or stored in a waste pile for further studies (if the volume is greater than 2500 yd^3).
Facility Area	- Filter any contaminated water in the facility area to remove asbestos fibers, followed by treatment of the water in a carbon adsorption system; the treated water will either be used as incineration quench water or disposed of through on-site evapo-transpiration.
	- No action at this time for remediating either the buildings or vessels in the facilities area. EPA has concluded that not enough information is available to support selection of a remedy at this time. Remedies to address this problem will be developed in the early part of the Phase III RI/FS.
Contaminated Surface Soils	- No action at this time; not enough information is available at this time to support selection of a remedy. Remedies to address this concern will be developed during future, continuing RI/FS studies at the site.
Monitoring of Remedies	- A variety of techniques will be used to monitor the effectiveness of the remedies; these will include stack testing for the incinerator, testing of ash residues, sampling of water treatment effluent, and monitoring for the ground water contaminant plume during continuing RI/FS activities.

EPA notes that this decision includes some options that will have to be exercised after more information is gathered during the design stage of remedy implementation. In particular:

- If the option to dispose of treated water through use as incineration quench water becomes infeasible, EPA will consider the evapo-transpiration disposal method. Any decision to implement the evapo-transpiration disposal method would be preceded by a pilot test of the treatment process. If determined to be non-hazardous, the water could be treated and disposed of on-site.

- EPA will decide whether to incinerate or stockpile visibly contaminated soils after the actual volume of these soils is determined. A volume less than 2500 yd^3 will result in a decision to incinerate, while a volume greater than 2500 yd^3 will result in temporary storage. A decision to store the soils temporarily will mean that remedies in addition to incineration will be evaluated for these soils during the continuing RI/FS process.

DECLARATIONS

I have determined that the selected remedy is protective of human health and the environment, and that all components of the remedy except one will attain all Federal and State requirements that are applicable or relevant and appropriate to the selected remedy. The one component of the remedy that may not achieve all the requirements is the on-site discharge of treated water, which is a backup remedy. If this component does not meet the requirements, EPA will exercise a waiver on the basis that this is an interim remedy, and that future (final) remedies would address the problem.

I have determined that the selected remedy is cost-effective, and that it will satisfy the CERCLA preference for remedies that include treatment to reduce the toxicity, mobility or volume of the hazardous substances as a principal element of the remedy. The selected remedy also satisfies the CERCLA requirement to utilize permanent solutions and alternative treatment to the maximum extent practicable. I have determined that the selected remedy will be consistent with possible future remedies for the site.

June 30, 1988
Date

James J. Scherer
Regional Administrator

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ABBREVIATIONS AND ACRONYMS

AIC	acceptable chronic intake
ARAR	applicable or relevant and appropriate requirements
BDAT	Best Demonstrated Available Technology
BIC	Broderick Investment Company
BFI	Browning Ferris Industries
BWP	Broderick Wood Products
CDD	chlorinated dibenzo-p-dioxin
CDF	chlorinated dibenzofuran
CDH	Colorado Department of Health
CDI	chronic daily intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (generally including the amendments from the Superfund Amendments and Reauthorization Act of 1986)
cy	cubic yard
DOJ	U.S. Department of Justice
EPA	U.S. Environmental Protection Agency
HSWA	Hazardous and Solid Waste Amendments of 1984
ICI	Industrial Compliance Incorporated
ITC	International Technologies Corporation
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
NAAQS	national ambient air quality standards
NCP	National Contingency Plan
NPL	National Priorities List of Hazardous Waste Sites
OU	Operable Unit
PAH	polycyclic aromatic hydrocarbon
PCD	partial consent decree
penta, PCP	pentachlorophenol
ppb	parts per billion
ppm	parts per million
RAA	remedial action alternative
RCRA	Resource Conservation and Recovery Act of 1976
RI/FS	remedial investigation/feasibility study
SARA	Superfund Amendments and Reauthorization Act of 1986
SDWA	Safe Drinking Water Act
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCLP	Toxicity Characteristic Leaching Procedure
TMV	Toxicity, Mobility and Volume

A. SITE LOCATION AND DESCRIPTION

The Broderick Wood Products (BWP) Superfund site is located in unincorporated Adams County near Denver, Colorado, in Sections 9 and 10 of Township 3 South and Range 68 West (Figure A-1). The site is mapped on the Arvada and Commerce City U.S. Geological Survey quadrangles at latitude 39°47'56" north and longitude 109°58'48" west. The City and County of Denver corporate boundary is about 3000 feet south of the site, and Interstate Highway 25 at 58th Avenue is about one-half mile east of the site.

The triangular-shaped BWP property encompasses approximately 64 acres and is situated in a primarily industrial area. It is bounded on the southwest by a right of way of the Colorado and Southern Railroad, on the southeast by a right of way of the Denver and Rio Grande Western Railroad, and on the north by Fisher Ditch. Also southeast of the BWP is the Koppers Company, an active wood treating operation. The nearest residences are less than one-eighth mile north of the property line.

The major site features (Figure A-2) include two surface impoundments, a partially modified natural depression (Pond 4), and a total of 19 buildings and structures. The structures include several storage buildings, the main office, a change room, a water pump house, two wood fabrication shelters, the treatment and boiler building, a shop and engine house. Four underground structures include a pit, the treatment building basement, and two cylinder basements.

In addition, there are 11 tanks, two catchment basins, one air cylinder and one pressure cylinder on the site. The capacities of these containers range from 2400 to 50,000 gallons. The contents of the containers have not been fully characterized, but may contain pentachlorophenol (penta) or creosote. The total volume of materials presently retained in these containers is approximately 9250 gallons.

South Ditch, a buried water pipeline, crosses the eastern portion of the property. A ditch owned by the United Water Company is reported to cross the southern tip of the property.

While access to the site is not entirely restricted, the main access road to the site is blocked by a locked gate. The main and secondary impoundments are surrounded by a wooden-slat snow fence. The fence is approximately three feet high and is not adequately supported in some areas, allowing it to lean. The treatment plant building is surrounded by a six-foot chain-link fence posted with warning signs.

The site is situated on an elevated alluvial terrace more than one-half mile south of Clear Creek, a perennial stream. The site is not within the Clear Creek 100-year floodplain. The surface of the site is relatively flat but dips gently to the northeast. Surface elevations range from 5206 feet in the northeastern corner of the site to 5227 feet in the southern corner.

There is little potential for surface drainage from the site because of existing topographic restraints and man-made barriers along the northern boundary. The railroad tracks along the southwestern and southeastern property boundaries effectively prevent surface water from entering the site.

There are three saturated or partially-saturated geologic units immediately underlying the site (Figure A-3). In descending order, they are:

1. Surficial Deposits - zero to 12 feet thick; silty, sandy windblown material, soil and fill; partially saturated.
2. Slocum Alluvium - one to 14 feet thick; pebbly clay, silt, sand and gravel; saturated.
3. Denver Formation - uppermost bedrock formation; about 350 to 450 feet thick; interbedded claystone, shale, siltstone, sandstone and conglomerate.

The regional dip of bedrock is gently toward the north-northeast. The upper seven to 15 feet of the Denver Formation are weathered bedrock with vertical fracturing, which decreases with depth. The unweathered bedrock below the weathered zone is consolidated and only locally fractured. The Phase II Remedial Investigation/ Feasibility Study (RI/FS) by ITC treated the weathered portion and the unweathered portion of the Denver Formation as two separate hydrologic units.

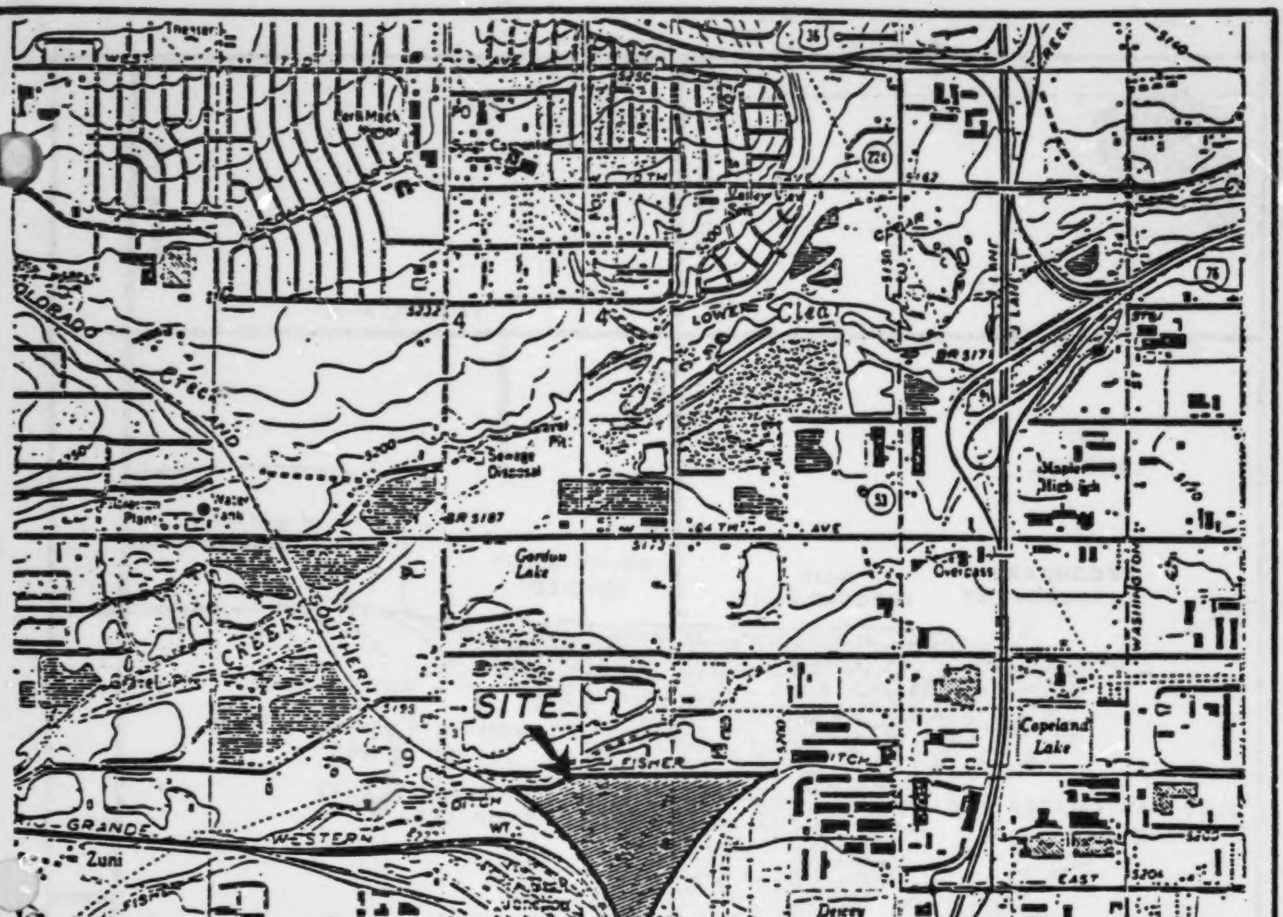
Ground water is present in a series of interconnected, water-bearing geologic units beneath the site. These units are recharged by subsurface inflow and infiltration of surface water. The Phase II RI/FS identified two aquifers beneath the site. The upper three geologic units (surficial deposits, alluvium and weathered bedrock) function as a single water table aquifer. The water table in this upper aquifer is three to 10 feet below the ground surface. The lower aquifer is in the upper portion of the unweathered Denver Formation. The potentiometric surface of the lower aquifer is generally about 2.5 feet below that of the upper aquifer. There are local and seasonal variations in the levels of these water tables on the site.

The ground-water flow is generally towards the north-northeast. The upper and lower aquifer ground-water flow patterns for the site are shown in Figures A-3 and A-4, respectively.

The soils and ground water at the BWP site have been affected by contamination from:

- creosote, penta and oils related to wood treatment operations;
- metals such as arsenic, lead, cadmium and copper; and
- other wastes including greases, paints, oils, degreasers, and solvents.

A more detailed discussion of this contamination is presented in Chapter C.


SITE
FISHER
DITCH
GRANDE
WESTERN
Zuni
Gordon Lake
Copeland Lake
Dewey Lake
Sewage Disposal
Maple High Sch
Overpass
COLORADO AND SOUTHERN
CREEK
Lower Clear Creek
Radio Towers (KICO)
Guardian Angels Sch
WEST ADAMS
DENVER CITY AND CO
Chaffee Park Shopping Center
16
9
4
15
SCALE IN FEET
1000 0 1000 2000
N

From USGS Topographic Maps, Arvada 7 1/2' and Commerce City 7 1/2, Colo., 1980

FIGURE A-1

BRODERICK WOOD PRODUCTS SITE LOCATION

Adams County, Colorado

JACOBS ENGINEERING GROUP INC.

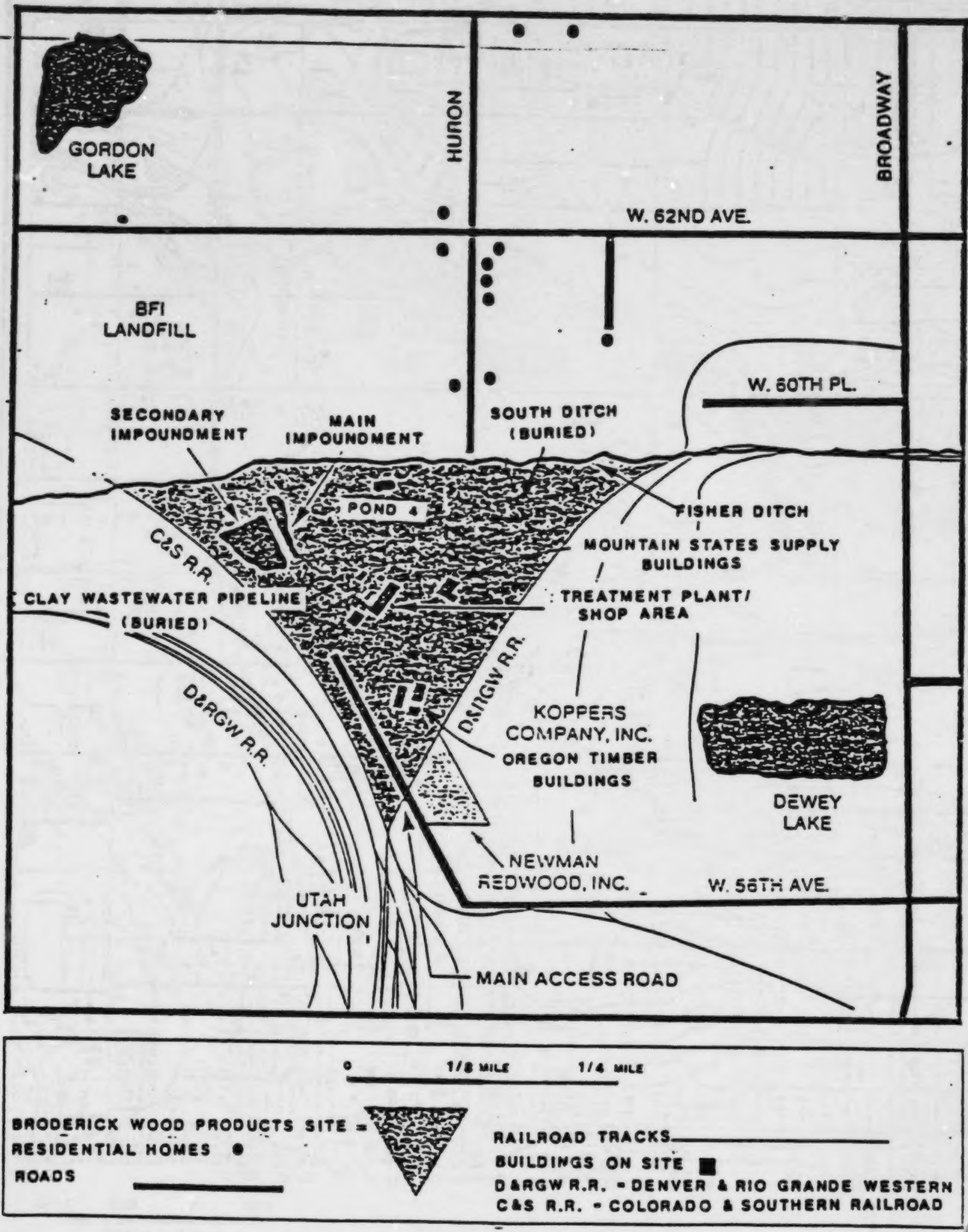
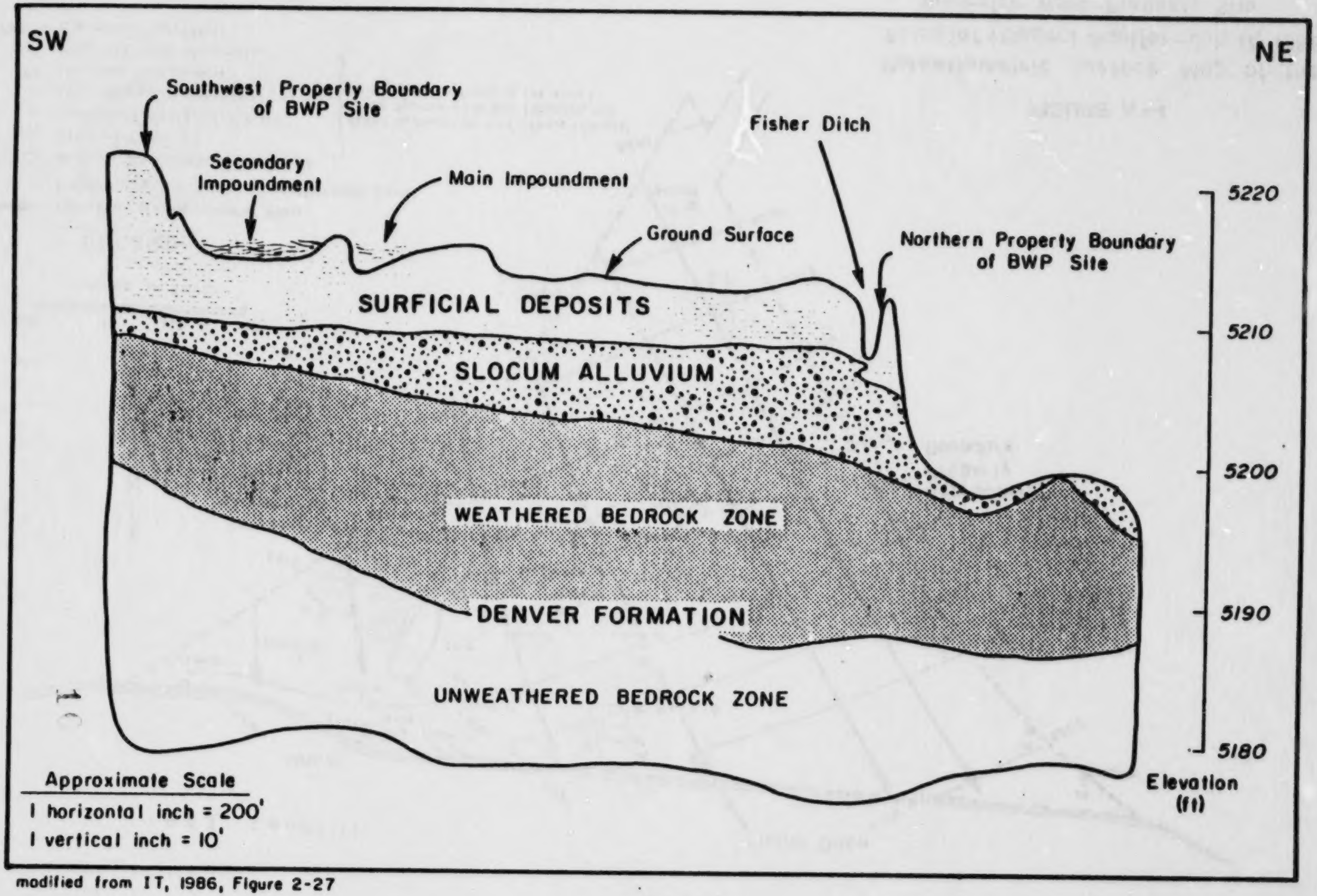

GORDON LAKE
HURON
BROADWAY
W. 62ND AVE.
BFI LANDFILL
W. 60TH PL.
SECONDARY IMPOUNDMENT
MAIN IMPOUNDMENT
SOUTH DITCH (BURIED)
POND 4
FISHER DITCH
C&S R.R.
MOUNTAIN STATES SUPPLY BUILDINGS
CLAY WASTEWATER PIPELINE (BURIED)
TREATMENT PLANT/ SHOP AREA
D&RGW R.R.
D&RGW R.R.
KOPPERS COMPANY, INC.
OREGON TIMBER BUILDINGS
DEWEY LAKE
NEWMAN REDWOOD, INC.
W. 56TH AVE.
UTAH JUNCTION
MAIN ACCESS ROAD
0
1/8 MILE
1/4 MILE
BRODERICK WOOD PRODUCTS SITE =
RESIDENTIAL HOMES ●
ROADS
RAILROAD TRACKS
BUILDINGS ON SITE ■
D&RGW R.R. - DENVER & RIO GRANDE WESTERN
C&S R.R. - COLORADO & SOUTHERN RAILROAD

FIGURE A-2

CURRENT SITE FEATURES


SW
NE
Southwest Property Boundary of BWP Site
Secondary Impoundment
Main Impoundment
Ground Surface
Fisher Ditch
Northern Property Boundary of BWP Site
SURFICIAL DEPOSITS
SLOCUM ALLUVIUM
WEATHERED BEDROCK ZONE
DENVER FORMATION
UNWEATHERED BEDROCK ZONE
5220
5210
5200
5190
5180
Elevation (ft)
Approximate Scale
1 horizontal inch = 200'
1 vertical inch = 10'

modified from IT, 1986, Figure 2-27

FIGURE A-3

SCHEMATIC GEOLOGIC CROSS SECTION OF THE BRODERICK WOOD PRODUCTS SITE
ADAMS COUNTY, COLORADO

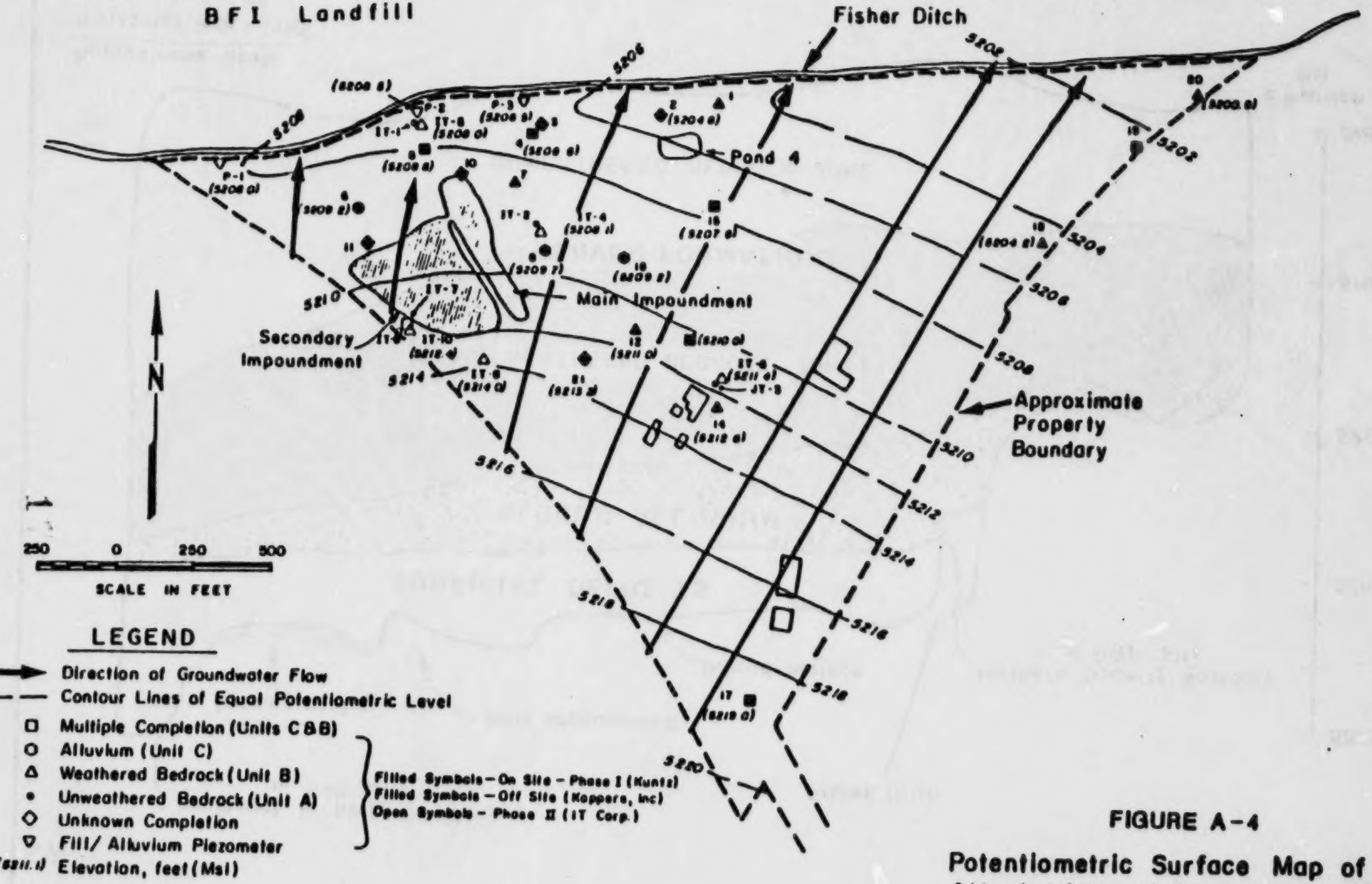

BFI Landfill
Fisher Ditch
Pond 4
Main Impoundment
Secondary Impoundment
Approximate Property Boundary
N
250 0 250 500
SCALE IN FEET
5202
5204
5206
5208
5210
5212
5214
5216
5218
5220
P-1 (5208 0)
P-2 (5208 8)
P-3 (5208 5)
IT-1
IT-2
IT-3
IT-4 (5208 1)
IT-5
IT-6 (5214 0)
IT-7
IT-8 (5208 0)
IT-9
IT-10 (5212.4)
(5209 7)
(5209 2)
(5204 0)
(5207 0)
(5210 0)
(5211 0)
(5213 2)
(5212 0)
(5219 0)
(5200.0)
LEGEND
Direction of Groundwater Flow
Contour Lines of Equal Potentiometric Level
□ Multiple Completion (Units C&B)
○ Alluvium (Unit C)
△ Weathered Bedrock (Unit B)
• Unweathered Bedrock (Unit A)
◇ Unknown Completion
▽ Fill/ Alluvium Piezometer
(5211.1) Elevation, feet (Msl)
Filled Symbols - On Site - Phase I (Kuntz)
Filled Symbols - Off Site (Koppers, Inc)
Open Symbols - Phase II (IT Corp.)

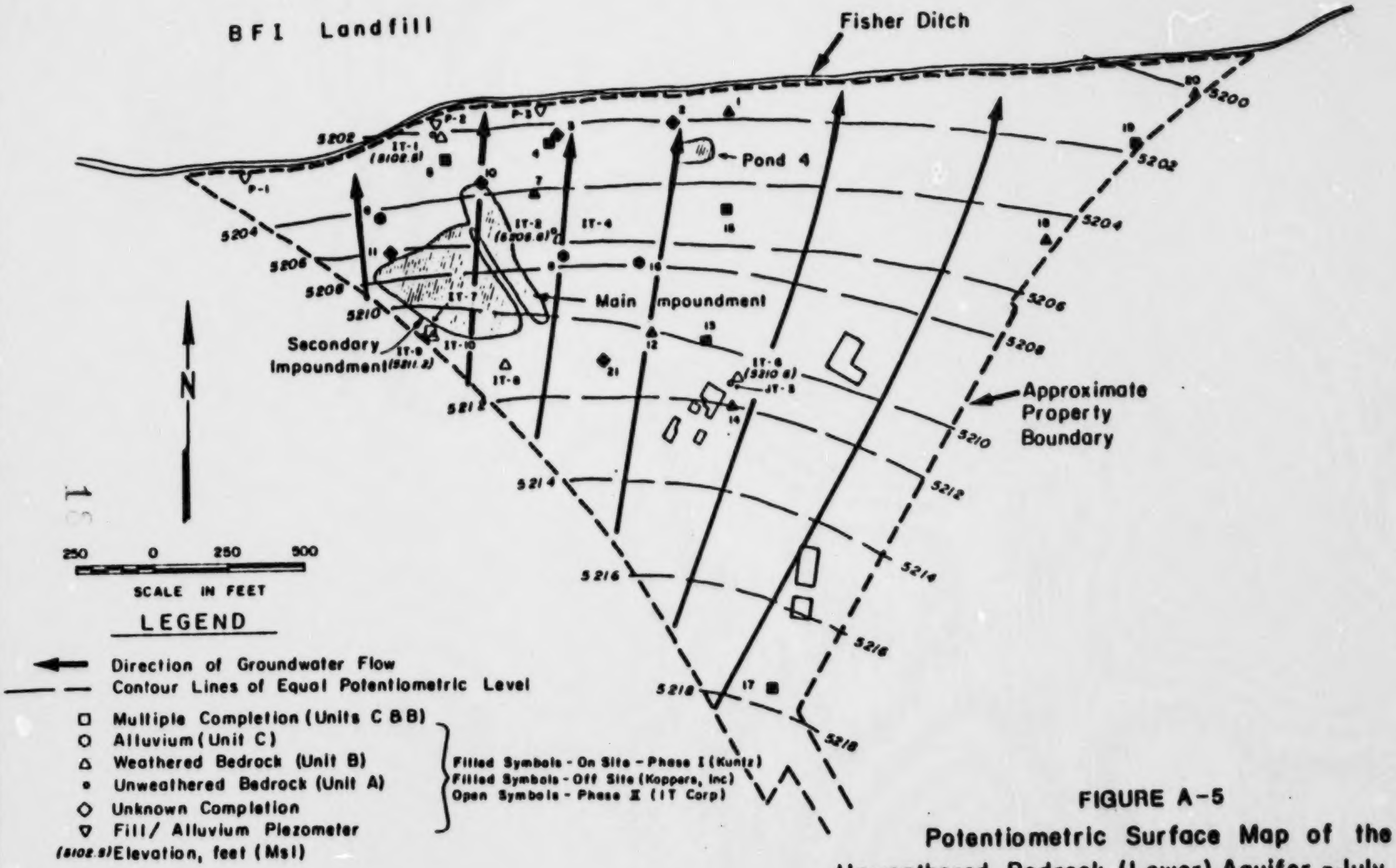
FIGURE A-4

Potentiometric Surface Map of the Alluvial (Upper) Aquifer - July 17, 1986

Broderick Wood Products Site
Adams County, Colorado

Note: Potentiometric contours and direction of flow lines are approximate. They were generalized from, and interpolated between, data points and general geology conditio[illegible] site. Information on actual water levels exists only at the well location[illegible] possible subsurface conditions may differ from those indicated at or b[illegible]h wells with the passage of time.

modified from IT, 1986, Fi[illegible] 2-36


BFI Landfill
Fisher Ditch
Pond 4
Main Impoundment
Secondary Impoundment
Approximate Property Boundary
N
IT-1 (5102.5)
IT-2 (5205.6)
IT-4
IT-5
IT-6 (5210.6)
IT-7
IT-8
IT-9 (5211.2)
IT-10
P-1
P-2
P-3
5200
5202
5204
5206
5208
5210
5212
5214
5216
5218
250
0
250
500
SCALE IN FEET
LEGEND
Direction of Groundwater Flow
Contour Lines of Equal Potentiometric Level
□ Multiple Completion (Units C & B)
○ Alluvium (Unit C)
△ Weathered Bedrock (Unit B)
• Unweathered Bedrock (Unit A)
◇ Unknown Completion
▽ Fill/ Alluvium Piezometer
(5102.5) Elevation, feet (Msl)
Filled Symbols - On Site - Phase I (Kuntz)
Filled Symbols - Off Site (Koppers, Inc)
Open Symbols - Phase II (IT Corp)

Note: Potentiometric contours and direction of flow lines are approximate. They were generalized from, and interpolated between data points and general geology conditions on site. Information on actual water levels exists only at the well location. It is possible subsurface conditions may differ from those indicated at or between wells with the passage of time.

FIGURE A-5

Potentiometric Surface Map of the Unweathered Bedrock (Lower) Aquifer - July 17, 1986
Broderick Wood Products Site
Adams County, Colorado

modified from IT, 1986, Figure 2-24

B. SITE HISTORY

History of BWP Operations

The BWP Company operated a wood treating facility to treat power poles, fence posts, railroad ties, and other wood products from 1947 to 1981. Wood preserving agents used in the treatment process were creosote and penta. Creosote was used throughout the life of the facility, and was typically mixed with carrier oil (for example, fuel oil). Penta (dissolved in carrier oil) was used on a limited basis prior to 1953 and on a regular basis from 1953 to 1980.

During the operational life of the facility, process waste from the plant was disposed of on the site, with much of it going to two unlined impoundments located in the northwest corner of the site (Figure B-1). The waste was conveyed to the impoundments through a ten inch diameter clay bell-and spigot pipe.

The main impoundment is reported to have been constructed in 1946 by filling in the ends of a railroad cut. However, there are still some unresolved inconsistencies among historical records about disposition of wastes during the early years of plant operation. Also, historical aerial photographs indicate that the main impoundment extended much closer to the northern site boundary during the early years.

In 1956, a secondary impoundment was constructed west of the main impoundment for additional evaporation capacity and as an overflow structure for the main impoundment.

According to historical documents, offsite migration of contaminants related to wood treating (creosote and oil) was noted as early as 1952, five years after the start of facility operations. The presence of creosote and oil seepage became apparent just north of the BWP site and eventually became so great that it was burned off, starting in 1955. Over the next five or six years, the seepage appeared to diminish.

Four other ponds that from time to time have been present on the site were identified through historic air photo interpretation. These ponds are designated Ponds 1 through 4 (Figure B-1).

Pond 1 was present from approximately 1950 to 1980. Pond 2 was present from approximately 1953 to 1974. Pond 3 was present from about 1963 to 1982, serving as an overflow structure for the secondary impoundment. From photographs taken during the 1960s, it appears that ditches ran between Pond 3 and the secondary impoundment as well as between Pond 3 and Pond 4.

Pond 4 has been evident in photographs from 1966 to the present. This pond is essentially a natural and man-modified depression where site-related drainage collects and infiltrates or evaporates. The areal extent of the pond varies with the amount of runoff collected. At times this pond is dry and at other times it may extend to the northeast corner of the site.

In 1958, a fire destroyed the shop building. During the same year, a new shop building was constructed.

In 1962, the main and secondary impoundments caught fire and burned for several hours.

In November, 1981, BWP ceased operations as a wood treater, citing market conditions. Seven months later, in June 1982, BWP's assets were liquidated into a trust-operated partnership known as the Broderick Investment Company (BIC), a Colorado limited partnership. The trustees of the partnership were the First National Bank (now the First Interstate Bank of Denver) and the Colorado National Bank of Denver. Shortly thereafter, the BWP Company was officially dissolved, making BIC the successor to BWP Company's business interest.

On July 12, 1985, the treatment plant building was damaged by a fire started by the torch of a welder who was dismantling the treatment facility. Some of the water used to fight the fire reportedly remains in the basement of this building and at other locations of the site.

History of Enforcement and Investigations at BWP

The recent history of the site has included numerous activities and investigations of contamination on and off the site. Most of these activities have been in response to or in coordination with regulatory and legal actions by the U.S. Environmental Protection Agency (EPA) and the Colorado Department of Health (CDH).

In August 1980, the BWP Company submitted a "Notification of Hazardous Waste Activity" as required under Section 3010 of the Resource Conservation and Recovery Act (RCRA). In November 1980, BWP submitted Part A of the application for a hazardous waste permit pursuant to Section 3005(e) of RCRA, thereby obtaining "interim status" to operate its facility.

In April 1981, EPA conducted a site inspection at BWP, and several violations of RCRA requirements were noted by the inspectors. On July 7, 1981, EPA issued a Notice of Violation (NOV) to BWP, citing BWP for not having the following required documents: waste analyses from the settlement pond, waste analysis plan, inspection plan, contingency plan, and operating plan. On July 29, 1981, BWP responded to the NOV, submitting an operating record, an inspection plan and a contingency plan.

A July 1982 inspection of the site by EPA revealed both continuing and additional violations of RCRA interim status requirements. Inspectors also learned that BWP had ceased operations in November, 1981, and that BWP had been dissolved, with the assets being liquidated into BIC.

The continuing violations at BWP prompted EPA, on October 27, 1982, to notify the BIC trustees of EPA's intent to file suit against BIC. This notice led to extensive communications between the trustees and EPA.

EPA conducted another inspection of the site in December, 1982. This inspection revealed the possibility of serious contamination at BWP, including a 10-foot by 50-foot trench that was observed about 40 feet north of the surface impoundments. This trench had reportedly been used only for the disposal of solid wastes; however, a black stain and oily puddle were noted at the bottom of the trench.

Also in December 1982, Browning Ferris Industries (BFI), a waste disposal company operating north of the site, reported that wood treating chemicals had been detected in water from one of their monitoring wells located immediately north of the surface impoundments.

In March 1983, the EPA invoked CERCLA authority and conducted a preliminary assessment and site investigation of the BWP site. Penta was detected in soil and ground-water samples taken both on and off the site.

Based on the information gathered during these investigations, the BWP site was nominated for inclusion on the National Priorities List (NPL) of hazardous waste sites in September 1983. In September 1984, the nomination was finalized and the site was placed on the NPL.

During 1984, EPA and CDH negotiated with BIC regarding studies to be conducted and remedies to be implemented at the site. The main focus of these studies and remedies was to be closure of the RCRA impoundments.

One of the central issues of these negotiations was who would conduct the studies, EPA or BIC. In February 1984, EPA issued 104(e) Information Requests to the trustees to obtain the results of studies that BIC had been conducting since early 1983. The trustees response to this request was embodied in a March 1984 investigation report by a BIC consultant (the "Kuntz report"). After a review of the report, EPA became concerned about BIC's ability to conduct an RI/FS properly, and concluded that it would be appropriate for the Agency to take the lead on the investigation.

BIC strongly objected to EPA's position on this matter. After negotiating further with EPA, BIC was allowed to continue with the RI/FS work. However, EPA insisted that the study be conducted under a court-approved consent decree.

During 1985, EPA and the Department of Justice (DOJ) negotiated with BIC and the trustees (collectively the "defendants") over the terms of the consent decree. In late 1985, the parties reached agreement on the terms of a Partial Consent Decree (PCD). The PCD was filed simultaneously with the original complaint on February 28, 1986, in the U.S. District Court for the District of Colorado. The court approved the PCD on May 21, 1986.

Under the PCD, the defendants agreed to pay $100,000 for the alleged violations of RCRA interim status regulations. The PCD also established a framework for the defendants to conduct a CERCLA-type remedial investigation and feasibility study (RI/FS), with a corresponding stay of discovery and litigation pending completion of the RI/FS and selection of remedies. Both parties retained all rights regarding implementation of remedies. A trust fund was established to finance RI/FS work.

The PCD contemplates the RI/FS being conducted in two or three phases. Preliminary work done by BIC's first consultant (Kuntz) in 1983-84 was considered Phase I. The decree covers conduct of Phase II and, if necessary, Phase III studies.

BIC and a new consultant (ITC) began work on the Phase II remedial investigation in late 1985. Preliminary sampling of the impoundments was conducted in March 1986, and more in-depth sampling of soils and ground water was conducted through the spring and summer of 1986.

BIC's consultant (ITC) experienced difficulties in the conduct of the Phase II RI/FS and requested a six week extension of the original due date for the report. EPA granted this request and a Joint Motion for Modification of the PCD was filed by the parties on December 1, 1986.

The Phase II RI/FS report was eventually submitted by BIC on December 5, 1986, twenty days after the extended due date. EPA, its consultants and CDH reviewed the draft report and submitted comments to BIC on March 26, 1987, identifying significant and extensive deficiencies in the report. Based on this review, EPA concluded that further studies (i.e., a Phase III RI/FS) would be required to document the nature and extent of contamination and to develop plans for a final remedy. However, EPA concluded that sufficient information was available to implement certain interim source control remedies, and requested BIC to revise the report to evaluate such remedies (operable units).

After negotiations with EPA, BIC agreed to this approach. Since the revisions could not be completed by the date required in the PCD as modified, a second PCD modification was exercised to address the change in approach. A Joint Motion for approval of a second modification was filed with the court on June 15, 1987, and approved on August 11, 1987. This modification affirmed stipulated penalties for the late submission of the original Phase II RI/FS report and required a revised Phase II report to address options for an operable unit. BIC retained a third consultant (Keystone) and submitted a revised Phase II RI/FS report on the due date of July 24, 1987.

EPA reviewed the revised report and concluded that, with certain modifications to the report, EPA would be able to propose certain interim remedies in a proposed plan. In an August 26, 1987 meeting, EPA informed BIC that EPA would develop the proposed modifications in a supplemental RI/FS report. The supplemental RI/FS report was completed November 5, 1987.

In February, 1988, EPA published a proposed plan based on the RI/FS studies and information to that date. EPA concurrently initiated a 21-day public comment period to invite comments on the proposed plan. A public meeting was held on February 22, 1988, and comments were received through the end of the comment period. EPA has reviewed those comments, and the reponses are presented in the attached Community Involvement Responsiveness Summary.

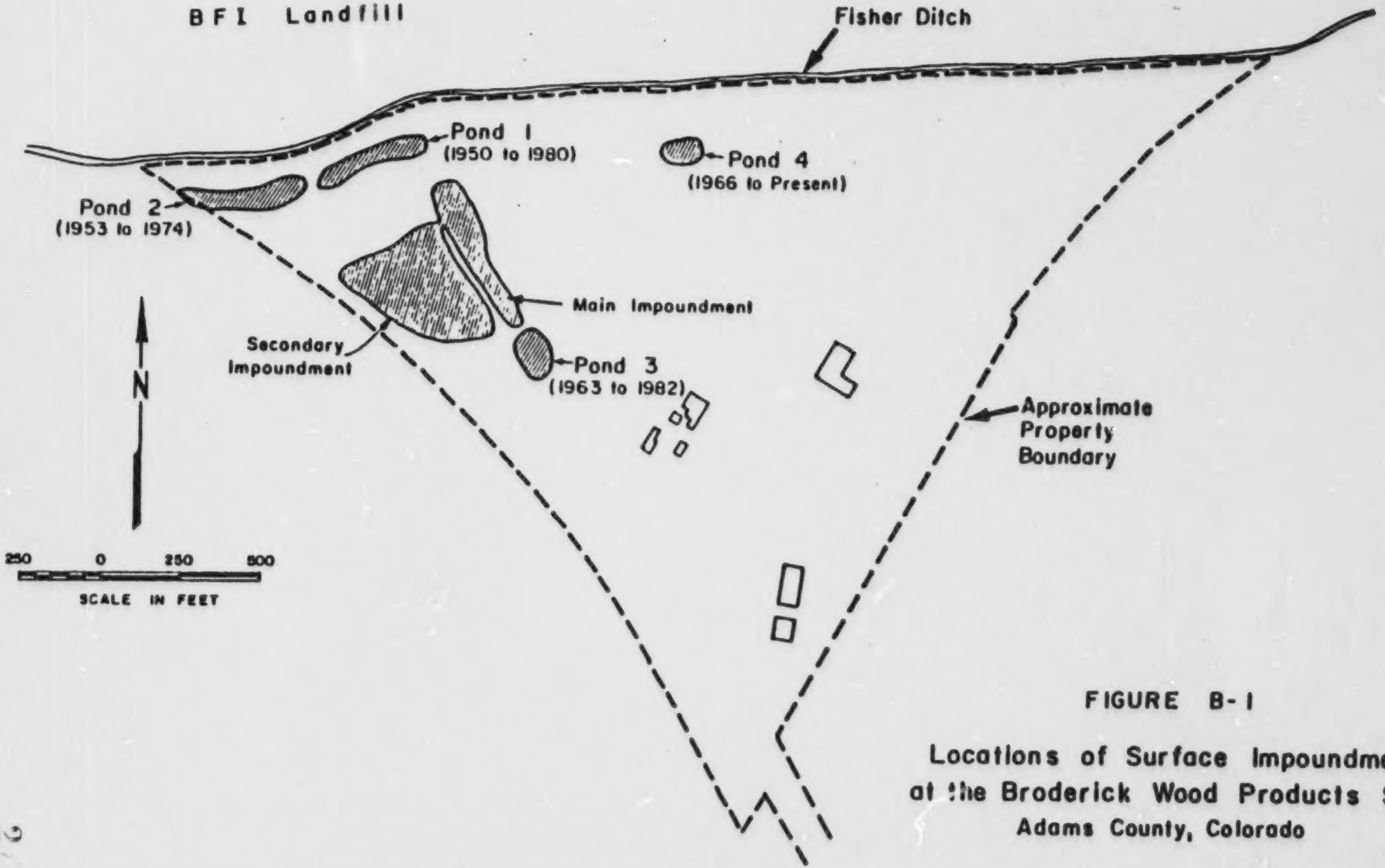

BFI Landfill
Fisher Ditch
Pond 1
(1950 to 1980)
Pond 4
(1966 to Present)
Pond 2
(1953 to 1974)
Main Impoundment
Secondary Impoundment
Pond 3
(1963 to 1982)
Approximate Property Boundary
N
250
0
250
500
SCALE IN FEET

FIGURE B-1

Locations of Surface Impoundments at the Broderick Wood Products Site
Adams County, Colorado

From IT, 1986

JACOBS ENGINEERING GROUP INC

C. SITE CHARACTERISTICS

In this chapter, the general nature and extent of contamination at the BWP site will be described, followed by a discussion of the site and hazardous substance characteristics and conditions using the five-segment structure developed by EPA and BIC to address interim site remedies in this operable unit. The five segments are: site access; the waste impoundments; the facility area structures, vessels and equipment; surface soils; and monitoring.

There will also be some discussion of additional information relating to other areas of contamination, most notably contamination of ground water. However, these areas will be addressed further in the continuing (Phase III) RI/FS, and will not be addressed in great detail here.

General

During the Phase I and II studies, hazardous substances were detected in a variety of site media, including:

- the surface impoundments
- the treatment facility and shop area structures and containers
- surface soil (0-2')
- subsurface soil (>2')
- bedrock materials
- surface water
- ground water

Table C-1 presents information showing the presence and maximum concentrations of the twenty indicator hazardous substances that were detected on the site, and the media in which each chemical was detected. These indicator chemicals were chosen because, in general, they represent the most toxic, mobile and persistent hazardous substances on site. However, it is possible that some areas on the site containing hazardous substances have not yet been identified.

Figures C-1 through C-3 show sampling locations at the BWP site.

1. Site access

Access to the BWP site is partially restricted by a combination of fences, signs, and natural barriers. The location of the site in an industrial area also serves to restrict the number of people who would enter the site. However, neither the location nor the barriers effectively prohibit site access. Trespassers (sometimes with vehicles) have been frequently documented entering and even camping on the site. The location of the site next to a major railroad yard appears to exacerbate the likelihood of trespass by transients and other unauthorized persons.

2. Surface Impoundments

Of all the surface impoundments on the site, the main and secondary impoundments contain the highest concentrations of indicator chemicals. The main impoundment contains a surface layer of oil, a water layer and a sludge layer, and the secondary impoundment contains only a sludge layer.

a. Main Impoundment

The main impoundment has the following characteristics:

- dimensions: 460 feet long by 40 to 90 feet wide
- surface area: 0.9 acre
- depth: about 5 feet from the ground surface
- total volume (capacity): approximately 1,400,000 gallons
- present contents:
  - surface oil: approximately 3000 gallons
  - water: approximately 560,000 gallons
  - sludge: 280,000 gallons (1400 yd^3)
  - total contents: 843,000 gallons (60% full)

The surface oil layer is close to 100 percent oil and grease. Thirteen indicator chemicals were detected in this layer and are summarized in Table C-1. Polycyclic aromatic hydrocarbons (PAHs) were present in concentrations exceeding 12,000 parts per million (ppm). Penta was detected at a concentration of 160 ppm. Dioxins and furans (expressed in equivalencies of 2,3,7,8 TCDD) were present in concentrations of 20 parts per billion (ppb), and small amounts of copper and lead were evident.

Samples from the water layer contained the lowest concentrations of hazardous substances within the main impoundment. Thirteen indicator chemicals were detected in the water (Table C-1). PAHs are present in concentrations of less than one ppm. The water is acidic (pH = 4.85).

The sludge layer of the main impoundment is a listed hazardous waste under RCRA (K001) and is the most highly contaminated medium on the site. Nineteen of the 20 indicator chemicals were detected in this layer (Table C-1). Some PAHs were detected in concentrations exceeding 100,000 ppm. Penta has been detected in concentrations of 11,000 ppm. Dioxin equivalencies were 18 ppb and the concentrations of metals (16 ppm copper, 12 ppm lead) were an order of magnitude larger than those in the surface oil.

b. Secondary Impoundment

The secondary impoundment is triangle-shaped with the following characteristics:

- side dimensions of 320 to 360 feet in length
- surface area is 1.8 acres
- total volume (capacity): about 600,000 gallons
- present contents: about 450,000 gallons (2200 yd^3) of partially dried sludge (about 75% full).

Although the secondary impoundment has only a sludge layer, some liquids are usually present following precipitation. This liquid reportedly evaporates during dry periods.

Seventeen indicator chemicals were detected in the secondary impoundment (Table C-1). The indicator chemicals are similar to those detected in the main impoundment sludge, with generally lower concentrations. The indicator chemical detected at the highest concentration was phenanthrene at 14,600 ppm. Penta was detected in concentrations as high as 8600 ppm. Copper and lead had concentrations of 20 and 29 ppm, respectively.

c. Other impoundments

As depicted in Figure B-1, Pond 1 was present from approximately 1950 to 1980. One sample, taken at location 49, tested the upper two feet of soil in this area. No indicator chemicals were detected, with the exception of 7.8 ppm copper and 11.2 ppm lead.

Pond 2 was present from approximately 1953 to 1974. No samples were taken of the upper two feet of soil in this area.

Pond 3 was present from about 1963 to 1982. At location 46, a soil sample was taken of the upper two feet and tested for the presence of indicator chemicals. This location is at the south end of the main impoundment, so it is unclear whether the source of contamination is from Pond 3 or the main impoundment. This sample contained 220 ppm penta. Eleven other indicator chemicals with concentrations around 10 ppm were also detected. Lead was detected at 39 ppm (Table C-1).

Pond 4 was evident on photographs from 1966 to the present. Five surface soil and one surface water samples have been taken from this area at locations 1, 2, 45, 50, and SB-15 (Figures C-1 and C-3). A maximum of 0.26 ppm penta was detected at location 45 (Table C-1). Contamination was not detected in samples from locations 1 and 2. The sample taken at location 50 contained 0.26 ppm cadmium, which is elevated over background levels.

d. Visibly Contaminated Soil Beneath the Impoundments

There are currently insufficient data to determine the full nature, extent or volume of the visibly contaminated soils beneath the impoundments. The volume has been estimated as great as 31,000 yd^3 (if the visible contamination extends to the top of the water table). It is also possible that "stringers" or pockets of contamination may extend further into the soil than the general mass of contamination.

It should be noted that the vertical extent of contamination in soils beneath the impoundments may be well below the top of the water table. Sufficient geologic characterization of conditions beneath the impoundments has not been attempted. The Phase III RI/FS will address this concern.

3. Facility Area (Buildings, Vessels, etc.)

Contamination in the facility area (from the buildings, vessels, equipment, etc.) of the site contribute to soil contamination, airborne particulates, and physical hazards. Asbestos used to insulate pipes is exposed in and around the plant and boiler buildings. Some of the asbestos was exposed by the fire in 1985 when the protective tar paper which covered the asbestos burned off. A July 1987 site visit verified that the asbestos insulation is not covered adequately.

Analyses of samples of the firewater (that is, water used to fight the 1985 fire) ponded in the basement of the plant building detected seven ppm penta. Measurable quantities of dioxin and furan were also detected. Other PAHs were not analyzed. An unknown quantity of this water was pumped into one of the on-site tanks. The tanks, catchment basins, and cylinders on the site have not been sampled. The Phase III RI/FS will address this concern.

4. Surface Soil

Much of the surface soil around the site is known or suspected of having been in contact with wood-preserving chemicals. It is also suspected that some surface soils may have been affected by previous railroad and mineral smelting activities adjacent to the site. There is evidence that portions of the site have been extensively re-graded. Actual laboratory test data on the surface soils are relatively sparse.

Approximately one-third of the surface of the site has been identified on aerial photographs as having dark soil in the past. It is not possible to positively determine the cause of dark soils that were observed. These areas were identified to document locations that may have been affected by wood treatment operations. Possible causes of the dark soil areas include spills of wood treating solution, disposal of sludges from storage tanks, and seepage from the surface impoundments. Other causes of dark soil could be related to precipitation or ponding of runoff.

During an EPA RCRA inspection in 1982, surface soils apparently saturated with a black oily substance were observed to the west of the secondary impoundment. A hole dug by hand in this area immediately filled with a black oily substance. Surface soils on the eastern edge of the property were also identified as possibly saturated with a black oily substance. No tests of surface soils in these areas were documented in the Phase II RI/FS reports.

Surface soils in the vicinity of the treatment plant, shop and the engine house areas have been tested. The highest concentrations of indicator chemicals in soil media, with the exception of metals, is in the treatment plant area. Nineteen indicator chemicals were detected at the treatment plant. Penta was detected at a concentration of 3300 ppm. Dioxin levels (reported in TCDD equivalencies) were as high as 3.5 ppb. Many of the other indicator chemicals were detected in concentrations ranging from 500 to 1400 ppm (Table C-1). Lead and copper were detected at concentrations of 499 and 255 ppm, respectively.

Concentrations of indicator chemicals in soils from the shop area are considerably lower than from the treatment plant area. Nineteen indicator chemicals were detected at concentrations of 10 to 90 ppm (Table C-1). Benzo(b)-fluoranthene was the exception with a concentration of 350 ppm. Penta was detected at a concentration of 46 ppm. Copper and lead were present at concentrations of 243 and 152 ppm, respectively.

Soils from the engine house area contained 17 of the indicator chemicals. As shown in Table C-1, metals were present in high concentrations. Lead, copper, cadmium and arsenic were detected at concentrations of 5300, 619, 144 and 117 ppm, respectively. Other nonmetallic indicator chemicals were generally detected in concentrations of six ppm or less. The exception was acenaphthene, which was detected at a concentration of 500 ppm.

Approximately 14 surface soil samples have been taken outside the treatment plant, shop and engine house areas. All of the samples were tested for penta. Samples from four locations (16, 46, 47, SB-15) contained measurable quantities of penta ranging from 0.6 to 220 ppm. Samples from 11 locations were tested for other nonmetallic indicator parameters. Samples from four locations (13, 46, 47 and SB-14) contained detectable levels of indicator parameters. Samples from five locations were tested for metals. Samples from three of these locations (46, 47 and 48) had elevated concentrations of metals compared to national norms.

5. Monitoring

Currently, monitoring of site conditions is limited to weekly visits by a former BWP employee who measures water levels in the ground water monitoring wells. The site has also been observed by neighboring businesses who have frequently reported unauthorized trespass by transients and others.

6. Additional

a. Surface Water

Tests of surface water runoff were limited to Pond 4, Fisher Ditch and off-site seeps. A related surface water issue is the interaction of ground water with the surface water in Fisher Ditch.

Surface water has been tested at five seep locations north of Fisher Ditch. SW-5 is a seep which surfaces north of Fisher Ditch, almost due north of the main impoundment. Fourteen indicator chemicals have been detected at this location. Typically, concentrations ranged from 0.01 to 0.3 ppm. Penta was detected at 1.8 ppm.

In June 1986, the surface water in Pond 4 was tested. Surface water at location 45 exhibited 11 indicator chemicals. Concentrations ranged from 0.001 to 0.8 ppm for most constituents. A notable exception was acenaphthene which was detected at a concentration of 110 ppm.

The water in Fisher Ditch has been analyzed 11 times. Four of the samples contained indicator chemicals. Penta was detected in concentrations of 0.05 ppm and less. There is evidence that ground water from the site interacts with the water in Fisher Ditch. Although the Phase II RI/FS concluded that ground water does not recharge Fisher Ditch, the data presented indicate recharge may be occurring along the western portion of the ditch.

b. Ground Water

Eighteen indicator chemicals have been detected in ground water samples from the site at concentrations up to 124,000 ppm. Water from wells adjacent to the impoundments contained the highest concentrations. The most contaminated portions of the ground water are associated with the floating and sinking phases of the wood-preserving chemicals. Concentrations of floating phase indicator chemicals are between 1300 and 18,000 ppm. Concentrations of the sinking phase indicator chemicals are generally between 490 and 14,000 ppm. The exception is naphthalene which was detected at 124,000 ppm.

c. Dioxins and furans

As with many wood treating plants, the potential presence of isomers of dioxins and furans has been a concern at the BWP site, and sampling and analysis for dioxins and furans has been conducted. Isomers of dioxins and furans have been detected in the impoundments, notably in the sludge and oil, and in some of the surface soils, particularly in the Facilities Area. However, only the heavier isomers of the dioxins and furans, such as penta, hexa, hepta and octa, were detected. The most potent isomer, 2,3,7,8 tetrachlorodibenzodioxin, was not detected in any medium.

The maximum concentrations found in the various media are presented in Table C-1, expressed as total dioxin equivalencies to 2,3,7,8 TCDD. This means that the concentrations of the less potent isomers were multiplied by certain equivalency factors to express their relative strength compared to 2,3,7,8 TCDD.

3

Table C-

MAXIMUM CONCENTRATIONS[1] OF INDICATOR CHEMICALS IN VARIOUS MEDIA AND LOCATIONS AT THE BRODERICK WOOD PRODUCTS SITE, ADAMS COUNTY, COLORADO

Indicator Parameters	Impoundment Contents				Surface Soils (0-2 ft)					
	Main			Secondary	Soils Near	Pond 4	Facilities	Shop	Engine	Drip
	(Oil) mg/l	(Water) mg/l	(Sludge) mg/kg	(Sludge) mg/kg	Impoundment mg/kg	(Sediment) mg/kg	Area mg/kg	Area mg/kg	House mg/kg	Tracks mg/kg
PAHs:										
Acenaphthene	1570	0.12	17300	4100	ND	470	790	27	500	ND
Acenaphthylene	ND	0.022(J)	380	ND	10(B)	170	29(J)	2.3(J)	ND	ND
Anthracene	12100	ND	47800	2500	10(B)	590	770	12(J)	.8	0.089(J)
Benzo(a)anthracene	ND	ND	1000	ND	10(B)	190	250	17	2.4	ND
Benzo(b)fluoranthene	ND	ND	ND	1200(J)	ND	150	ND	350(J)	4.9	0.460
Benzo(a)pyrene	260	ND	400	ND	10(B)	100(B)		16(J)	2.5	0.150(J)
Chrysene	1680	0.083	1200	2200	10(B)	690	320	23(J)	2.8	0.320(J)
Fluoranthene	8700	0.630	16000	11000	10(B)	3200	1300	79(J)	5.9	0.33
Fluorene	3590	0.062	20200	4300	ND	810	500	16	0.24	ND
Napthalene	1170	1.1	110000	11000	ND	100(B)	500	26	0.13	ND
Pyrene	4960	0.170	10200	7800	25(B)	1900	1400	91	6.0	0.45
Phenathrene	9000	0.340	12000	14600	25(B)	420	1400	50	3.8	0.13(J)
2-Methylnaphthalene	ND	ND	2900	ND	ND	100(B)	320(J)	8.1	0.11	ND
Phenolics:										
Pentachlorophenol	160	0.69	11000	8600	220		3300	46	ND	ND
VOCs:										
Benzene	ND	ND	4.5	0.11(J)	ND	ND	0.023(J)	ND	ND	ND
Dibenzodioxins/Dibenzofurans (ppb):										
TCDD (equivalency[2])	20	0.002	18	9.5	ND	0.03	3.5	1.5	0.0007	0.06
Metals:										
Arsenic	ND	0.004	1.9	2.3	1.1	ND	12	10	117	5.2
Cadmium	ND	ND	2	4	0.11	0.26	4.3	3.0	144	ND
Copper	8	0.050	16	20	14.7	8.3	255	243	619	14
Lead	0.73	0.006	12	29	39	5.9	499	152	5310	14

Notes:

1. Data compiled from ITC, 1986, Tables 2.22 through 2.27, Tables 2.42 through 2.49, Table 3.4, and Appendix B (See Figure C-3 for general locations). Data qualifiers: B = Mass spectral data indicate the presence of a compound that meets the identification criteria; the quantitative result is less than detection limit but greater than zero. Actual value, within the limitations of this analytical method, is less than value given; J = estimated value; ND = Not detected.

2. Concentrations of all isomers of TCDD are expressed cumulatively in equivalencies of TCDD

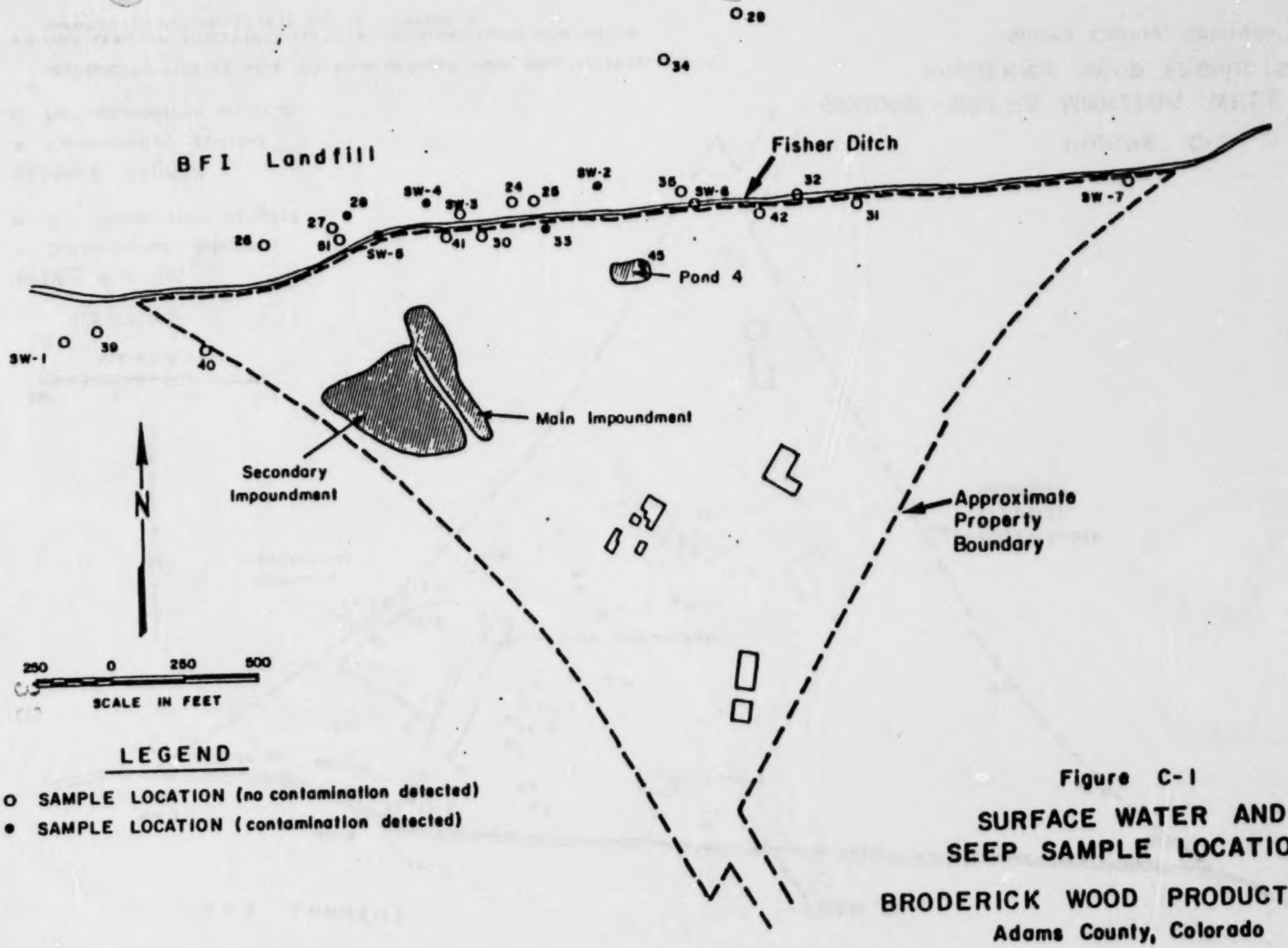

O 29
O 34
BFI Landfill
Fisher Ditch
SW-4
SW-3
SW-2
24
25
28
27
26
81
SW-5
41
30
33
35
SW-6
32
42
31
SW-7
45
Pond 4
SW-1
39
40
Main Impoundment
Secondary Impoundment
Approximate Property Boundary
N
250
0
250
500
SCALE IN FEET
LEGEND
○ SAMPLE LOCATION (no contamination detected)
● SAMPLE LOCATION (contamination detected)

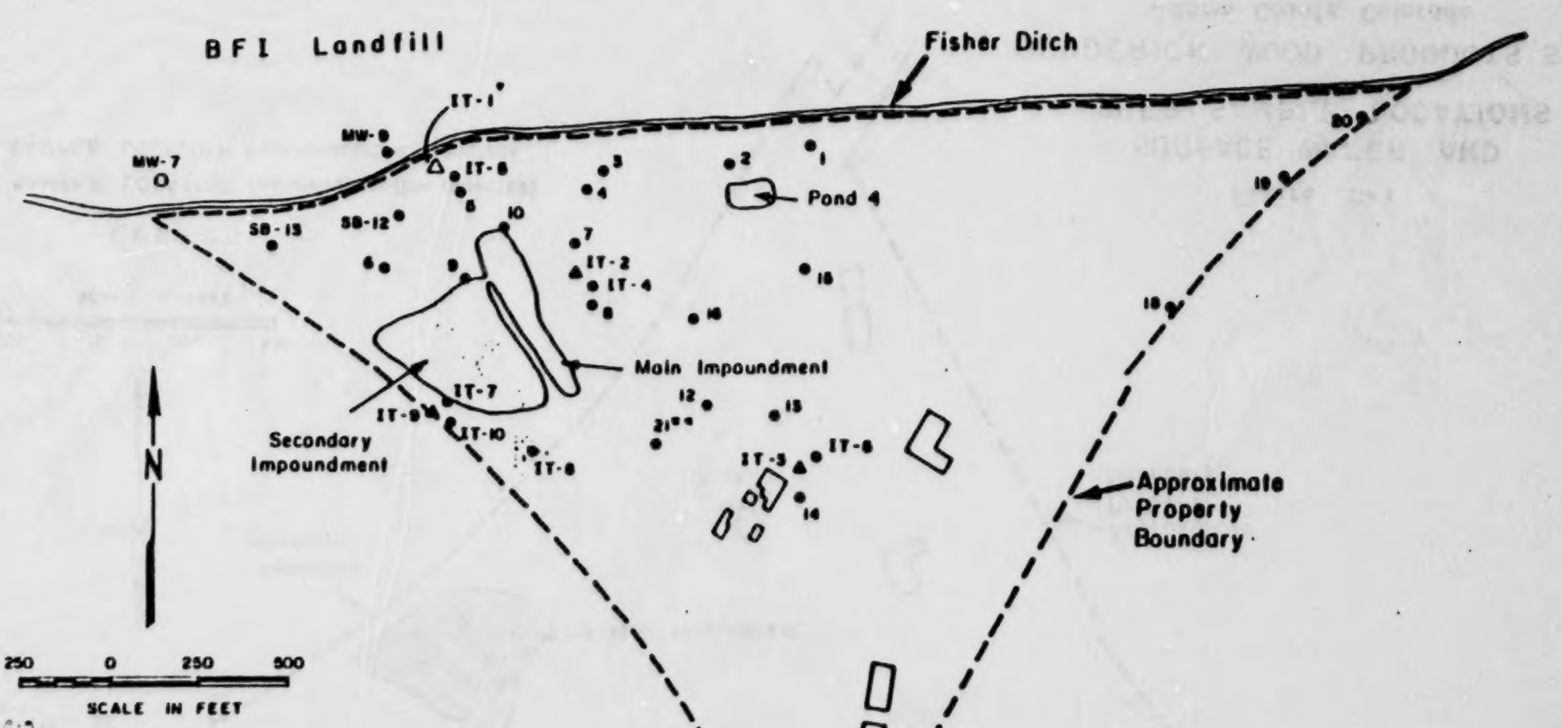
Figure C-1

SURFACE WATER AND
SEEP SAMPLE LOCATIONS

BRODERICK WOOD PRODUCTS SITE
Adams County, Colorado

JACOBS ENGINEERING GROUP INC

From IT, 1986


BFI Landfill
Fisher Ditch
MW-7
MW-9
IT-1*
IT-5
5
SB-13
SB-12
6
9
10
IT-7
IT-9
IT-10
IT-8
Secondary Impoundment
Main Impoundment
3
4
7
IT-2
IT-4
8
2
1
Pond 4
15
16
12
13
21**
IT-3
IT-6
14
17
18
19
20
Approximate Property Boundary
N
250
0
250
500
SCALE IN FEET

LEGEND

UPPER AQUIFER

● Contamination detected

○ No contamination detected

BEDROCK AQUIFER

▲ Contamination detected

△ No contamination detected

* GROUNCWATER SAMPLES HAVE NOT BEEN OBTAINED FROM WELL IT-1 (WELL BB-1)

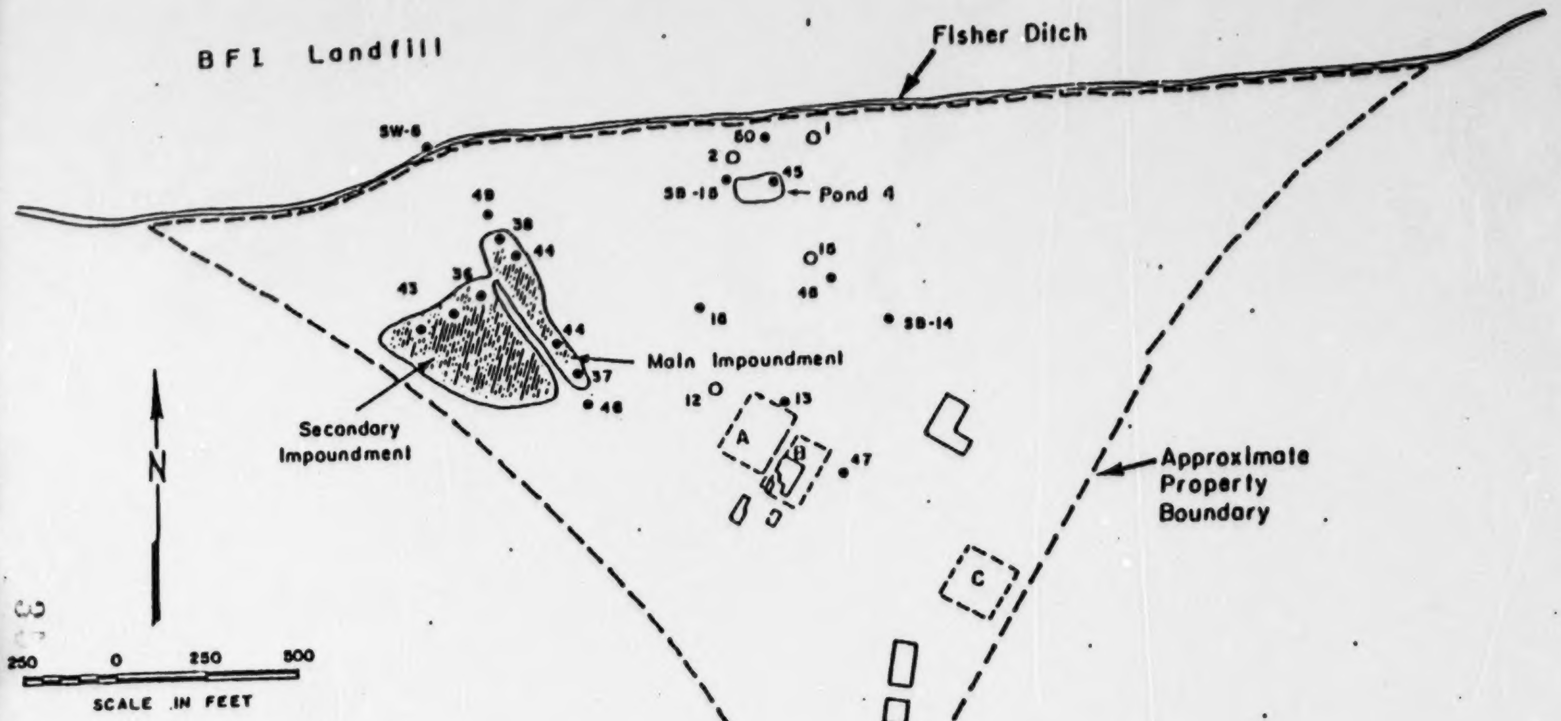
** ONLY VERY LOW CONCENTRATIONS OF PENTACHLOROPHENOL (0.02 mg/l) & NAPHTHALENE (0.05 mg/l) DETECTED AT LOCATION 21

FROM IT, 19 gures 2-4, 2-12

FIGURE C-2

GROUND-WATER MONITOR WELL LOCATIONS
BRODERICK WOOD PRODUCTS SITE
Adams County, Colorado

JACOBS ENGINEERING G P INC


BFI Landfill
Fisher Ditch
SW-6
49
38
44
36
43
44
37
46
Main Impoundment
Secondary Impoundment
50
1
2
45
SB-15
Pond 4
15
48
16
SB-14
12
13
A
B
47
C
Approximate Property Boundary
N
250
0
250
500
SCALE IN FEET

LEGEND

○ SAMPLE LOCATION (no contamination detected)

● SAMPLE LOCATION (contamination detected)

[ ] COMPOSITE SAMPLE AREA
(contamination detected in all composite sample areas)

A - Shop Area
B - Treatment Plant
C - Engine House Area

FROM IT, 1986, Figures 2-4, 2-11, 2-12

FIGURE C-3

SURFACE SOIL SAMPLE LOCATIONS
BRODERICK WOOD PRODUCTS SITE
Adams County, Colorado

JACOBS ENGINEERING GROUP INC

D. PUBLIC HEALTH AND ENVIRONMENTAL RISKS

Scope of Risk Analysis, Risk Scenarios

Based on the data gathered thus far, the contamination associated with the BWP site poses a variety of actual and potential risks to human health and the environment. Thus far, no risk scenarios identified with the site have been eliminated from risk analysis, and the full range of scenarios (from industrial use through residential use) remain for consideration.

However, as noted previously, the full nature and extent of contamination have not yet been characterized. This lack of complete characterization is most obvious for the ground water exposure pathway, particularly in the area north of the site. Characterization of this pathway is expected to be accomplished with the Phase III RI/FS, and will be addressed in a future record of decision.

As a consequence of the current incomplete level of characterization, the scope of risk analysis for this record of decision has generally been limited to those pathways about which there are sufficient data to support risk analysis and for which remedies are being considered. These pathways are generally those associated with on-site risks and direct contact, as well as those that can be addressed with the source control types of remedies contemplated by BIC and EPA in the revised and supplemental Phase II RI/FS reports.

Where appropriate, there will also be some discussion of other risk pathways.

Risk Pathways

Within the limited scope of this operable unit and the currently available data, the significant actual and potential exposure pathways identified for the BWP site include:

1. Ingestion of hazardous substances in surface soil and the impoundments.
2. Direct dermal contact with hazardous substances in surface soil and the impoundments.
3. Inhalation of airborne hazardous substances.
4. Ingestion of food crops contaminated with hazardous substances.
5. Ingestion of contaminated ground water below the site.

Receptor Populations

Potential and actual populations at risk from contamination at the BWP site include:

1. On-site workers, including the caretaker and remedial workers.
2. Trespassers, including children and transients.
3. Future workplace populations, including children in workplace day-care centers.
4. Future residential populations, including children.
5. Off-site users of ground water from the site.
6. Off-site populations immediately adjacent to the site.

The pathways by which hazardous substances from the site may reach human and environmental receptors are depicted in Figure D-1.

Contaminants, Hazardous Effects

The analysis of risk at the BWP site included selection and evaluation of certain indicator chemicals which represent the most toxic, mobile and persistent hazardous substances associated with the site. The indicator chemicals consisted of all those listed in Table C-1, including:

1. many of the polynuclear aromatic hydrocarbons (PAHs) that make up cresoste;
2. pentachlorophenol, representing the phenolics group;
3. benzene, representing volatile organics;
4. 2,3,7,8 - tetrachlorodibenzo-p-dioxin, representing the dioxins and furans; and
5. arsenic, cadmium, copper and lead, representing the metals.

Ingestion of any of the indicator chemicals has the potential to cause damage to organ systems. For example, naphthalene, acenaphthene, penta, benzene, and copper cause liver and kidney damage. Lead primarily affects the hematopoietic (blood-forming) system and central nervous system and has been linked to learning disabilities in children. Cadmium is a teratogen. Both cadmium and lead are reproductive toxins.

Several indicator chemicals have the potential to cause health effects if inhaled. Some of the chemicals, including the PAHs, may be absorbed into the body through the lungs, resulting in health effects similar to those resulting from ingestion. Some of these chemicals also have direct effects on the respiratory system. Inhalation of arsenic compounds and cadmium causes lung cancer, while benzene vapors and penta irritate the upper respiratory tract and eyes.

Dermal contact with PAHs, penta, and benzene cause skin irritation and possibly dermatitis. Naphthalene, penta, benzene, TCDD, and lead can be dermally absorbed, once again resulting in health effects similar in some cases to the effects from ingestion.

Human Health Risk

The following potential or actual human health risks associated with direct contact with hazardous substances on the BWP site have been identified:

1. Ingestion of Contaminated Surface Soil

Inadvertent ingestion of hazardous substances in surface soils may occur if children or other trespassers gain access to the site. A potential worst case scenario was evaluated using inadvertent ingestion by children of soils containing the maximum concentrations of indicator chemicals detected in soil at the site. To obtain a range of risk, two ingestion rates were used: 0.1 grams of soil per day and 5.0 grams per day, occurring once a week for five years.

In estimating the carcinogenic effects of this exposure scenario, it was determined that the increased cancer risk ranged from negligible to as high as 6.4×10^{-2}, or 6.4 increased cancers in a lifetime per 100 population. The greatest risks were those associated with ingesting carcinogenic PAHs at the 5.0 grams per day level.

To estimate noncarcinogenic effects of this scenario, the estimated chronic daily intake (CDI) of noncarcinogenic hazardous substances from soil ingestion was compared with acceptable chronic intakes (AIC). The CDIs for lead exceed the AIC by factors of three and 157, respectively at the 0.1 and 5.0 grams per day levels. The CDIs for penta and cadmium exceed the AICs at the 5.0 grams per day level.

Because of their current aesthetic quality, the impoundments were not included in this ingestion scenario. However, a future scenario based on no remediation of the impoundments would likely result in even greater risks if the site were regraded and the impoundment contents were mixed with other surface soils.

2. Direct Dermal Contact with Hazardous Substances

Direct dermal contact, particularly with the high concentrations of indicator chemicals in the impoundments, poses a risk of skin irritation and dermatitis, as well as other health effects associated with dermal absorption of the indicator chemicals. Chronic exposure to some PAHs and dioxins poses a cancer risk. The populations at risk include on-site workers and site trespassers, including children.

3. Inhalation of Vapors and Contaminated Dust

Inhalation by on-site personnel and trespassers of volatilized hazardous substances from the impoundments and soils contaminated with hazardous substances can occur and pose a health threat to such persons. Because sufficient air monitoring data are not available, the human health risk cannot be quantitatively evaluated at this time.

The presence of asbestos in and adjacent to buildings on the site poses a health risk. Site personnel and trespassers may be exposed by direct contact to the asbestos insulation or by inhalation of airborne fibers.

4. Ingestion of Contaminated Food Crops

Under the present land use, food crops are not grown at the BWP site. If the land is used for residential or agricultural purposes in the future, humans may be exposed to hazardous substances either taken up by food crops grown in contaminated soil or as a result of contamination of food crops with contaminated irrigation water. Insufficient information about ground water contamination is available to evaluate the human health risk quantitatively.

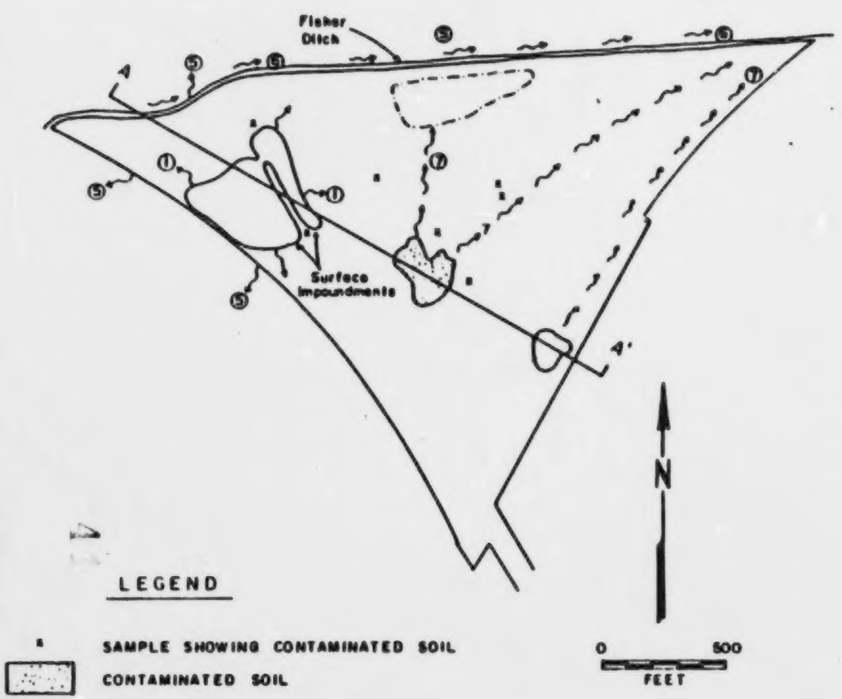
5. Ingestion of Contaminated Ground Water

Because of the lack of adequate data, ground-water impacts were not evaluated in detail. However, the use of ground water as a potable water supply off the site is potentially a significant pathway for exposure to hazardous substances from the BWP site. The maximum concentrations of indicator chemicals in ground-water samples taken on the site exceed appropriate water quality criteria. Consequently, any future use of this ground water for human consumption poses a potential health risk requiring further evaluation during the Phase III RI/FS.

Environmental Impacts

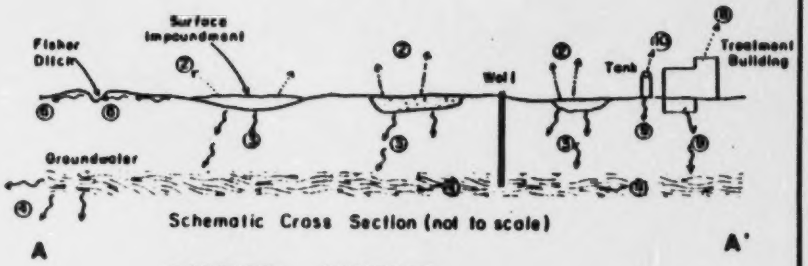
The following environmental impacts have been identified at the BWP site:

1. Damage to ground water, resulting in loss of a natural resource and potential impact on socioeconomic development.
2. Impact on wildlife as a result of direct contact with hazardous substances or by ingestion of contaminated water from the surface impoundments.
3. Impact on wildlife and domestic animals from exposure to contaminated soils.
4. Other socioeconomic impacts such as decrease in property value and economic development.


Fisher Ditch
Surface Impoundments
A
A'
N
0
500
FEET
①
⑤
⑥
⑦

LEGEND

- ▪ SAMPLE SHOWING CONTAMINATED SOIL
- ▨ CONTAMINATED SOIL
- ◯ CONTAMINATED SURFACE IMPOUNDMENT
- ◌ POND 4 - SURFACE WATER COLLECTION AREA
- ⤳ POTENTIAL CONTAMINANT MIGRATION PATHWAY
- A ⌴ A' SCHEMATIC CROSS SECTION


Fisher Ditch
Surface Impoundment
Well
Tank
Treatment Building
Groundwater
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Schematic Cross Section (not to scale)

POTENTIAL PATHWAYS

1) Wind deposition of contaminated surface water on surrounding soil
2) Volatilization of hazardous substances from contaminated surface water or soil
3) Infiltration of contaminated surface water from surface impoundments and ponds into soil and ground water
4) Subsurface lateral and vertical migration of contaminants via ground water to bedrock and off-site alluvium and bedrock
5) Contaminated ground water resurfaces as seeps
6) Contaminated ground water recharging Fisher Ditch and transported off site with water flow
7) Surface runoff from contaminated soil areas to Fisher Ditch or off site soil
8) Airborne transport of asbestos fibers
9) Infiltration of contaminated water ponded in basement of treatment plant building and of hazardous substances from on-site containers
10) Volatilization of hazardous substances from on-site containers

FIGURE D-1

Potential Surface and Subsurface Contaminant Migration Pathways at the Broderick Wood Products Site
Adams County, Colorado

JACOBS ENGINEERING GROUP INC.

E. SCOPE AND ROLE OF RESPONSE ACTION

Response Actions as Operable Units

As noted previously, the remedy selected in this document is an interim remedy or "operable unit." EPA is selecting this remedy as part of a multi-phase cleanup process at the BWP site.

The current National Contingency Plan (NCP) contemplates selecting and implementing such "phased" operable units prior to selection of an appropriate final remedial action for a site. Such operable units must be cost-effective and consistent with achieving a permanent remedy at the site.

The Multi-Phase Process at BWP

Phase I of the RI/FS at BWP consisted of studies conducted by a BIC consultant during 1983-84. While the information gathered during these studies has provided useful background information, the Phase I studies and report did not lead to any remedy selection.

After BIC submitted the Phase I report, EPA and BIC negotiated over further RI/FS activities to be conducted. These negotiations resulted in a partial consent decree (PCD), which required BIC to conduct a Phase II RI/FS to define the extent of contamination and develop remedies to address the problem. Additionally, a Phase III RI/FS would be required if EPA concluded that the Phase II RI/FS did not sufficiently address the problem.

After reviewing the draft Phase II RI/FS report submitted by BIC in December 1986, EPA concluded that further (Phase III) RI/FS studies would be required. The Phase III RI/FS will define the full nature and extent of contamination associated with the site, and develop remedies to address that contamination. The main focus of Phase III will be: the contaminant plume offsite to the north and in the bedrock; contamination in surface soils at the site; and "hot spots" of contamination at the site, including buildings and vessels. After the Phase III RI/FS is completed, a remedy will be selected to address the remaining contamination.

However, EPA also concluded that the draft Phase II report was complete insofar as the information in the report was sufficient to support implementation of certain interim remedies while the Phase III RI/FS is conducted. EPA was particularly interested in those remedies relating to source control and the direct contact pathway. EPA believed that implementation of these remedies would be consistent with future studies and remedies at the site.

Scope of This Operable Unit at BWP

After considering EPA's comments, BIC agreed to revise the draft Phase II RI/FS report to address or develop interim remedies relating to the following five "segments" of site cleanup:

1. **SITE ACCESS:** The revised report considered remedies to address the fact that access to the site is not adequately restricted. Access restrictions such as signs, fences and security guards were evaluated.

2. **IMPOUNDMENTS:** The main and secondary impoundments remain the major sources of contamination on the site. The revised report addressed the impoundment contents (sludge, oil and water), as well as the visibly contaminated soils directly under the impoundments.

3. **FACILITY AREA (BUILDINGS, VESSELS, ETC.):** This segment of the revised RI/FS addressed potential demolition and disposal of contaminated and fire-damaged structures in the Treatment Facilities and Shop Areas. Also to be addressed in this segment were potential remedies for the contents of the vessels, including the "firewater" remaining after the July 1985 fire.

4. **SURFACE SOILS:** In this segment, remedies for contamination of surface soils at the site were evaluated. These evaluations were somewhat constricted by the lack of complete knowledge about the nature and extent of the contamination.

5. **MONITORING:** Under this segment, the RI/FS process focused on methods to measure the effectiveness of the various remedies being proposed. These methods included such monitoring techniques as inspections, sampling of emissions, ground water monitoring, etc.

After receipt and review of the revised Phase II RI/FS report submitted by BIC, EPA concluded that certain modifications to the report were required to support the remedies that EPA believed were supportable by the studies. EPA tasked its contractor to perform these modifications, and a supplemental Phase II RI/FS report was completed in November 1987.

The remedies considered for this first OU at the BWP site are based on all three of the Phase II RI/FS reports: the draft and revised Phase II RI/FS reports submitted by BIC, and the supplemental report developed for EPA.

F. EVALUATION OF REMEDIAL ALTERNATIVES

Five Segment Approach

As discussed in chapter E, the remedies evaluated as part of the first operable unit (OU) at the BWP site during the Phase II RI/FS were based on the five segments to be addressed in the OU. These segments are:

- site access;
- the surface impoundments;
- the facility area (buildings, vessels, etc.);
- surface soils; and
- monitoring

The remedies considered under each of these segments were designed to address the chief health and/or environmental risks associated with each segment. The evaluation process summarized here will also use this five-segment structure.

Remedial Action Objectives

The overall objective of any remedial action at the BWP site is to protect human health and welfare, and the environment. Any remedial actions must also comply with CERCLA (as amended by SARA), and the National Contingency Plan (NCP) [40 CFR Part 300].

Specific objectives for remedial actions at the site in this OU involve the following:

1. Addressing the contents of the impoundments as the greatest concentration of contaminants on site; measures to address these contaminants would necessarily address all applicable or relevant and appropriate requirements that govern such measures.

2. mitigating the following risks or pathways summarized from Section D:

   - Ingestion of hazardous substances in the surface soils and the impoundments.

   - Direct dermal contact with hazardous substances in surface soils and the impoundments.

   - Inhalation of airborne hazardous substances.

   - Ingestion of contaminated ground water.

Initial Screening

As noted previously, the Phase II RI/FS is documented in the two BIC reports and the EPA supplemental report. These reports identified over 40 remedial action alternatives (in addition to the No Action alternative) for consideration as solutions to the various risks and pathway scenarios posed by contamination at the BWP site. Descriptions of the various alternatives are contained in the three reports, and many of them are summarized later in this chapter.

All of the 40+ alternatives identified in the reports were first subjected to an initial screening to eliminate those, which for reasons of technical infeasibility or lack of implementability, did not merit further consideration as remedies in this OU. A related purpose for the initial screening was to reduce the number of alternatives for a subsequent, more rigorous detailed evaluation.

In this initial screening process, several of the alternatives were eliminated from further consideration for a variety of reasons. For example, several of the alternatives for treating contaminated water were judged infeasible because of administrative or regulatory constraints. Also, all of the alternatives to address surface soil contamination were eliminated because the full extent of that contamination has not yet been defined, and because soil cleanup goals for the site have not yet been established. Soil remediation will be addressed in the Phase III RI/FS.

Description of Alternatives

Those alternatives that remained after the initial screening are presented in Table F-1. These alternatives were carried through the rest of the evaluation process. A summary description of each of these alternatives (using the five-segment structure) follows:

I. **SITE ACCESS** - under this segment, the remedies evaluated included the following:

A. **No Action**

The site would remain in its current condition; site access restrictions would not be modified.

B. Posting Notices

Twenty warning signs displaying the warning: "Danger - Hazardous Waste - Unauthorized Personnel Keep Out" would be posted around the site in strategic locations. Two options were evaluated, signs that are legible at 50 feet, and signs legible at 125 feet.

C. Selective Fencing

A six-foot chain-link fence would be erected around the surface impoundments. This would prevent access to an area defined by the impoundments. Additionally, a "field farm fence" would be erected around the visibly contaminated surficial soil areas in the treatment plant/shop area.

D. Fencing Entire Site

A six-foot chain-link fence topped with three strands of barbed wire would be erected around the perimeter of the site. Two 20-foot wide gates would be included for site access and fire control.

E. Security Guards

Access to the site would be monitored and restricted by providing guards on a 24 hours per day - 7 days per week schedule. Provisions for this security would include a shelter, electrical and telephone hookups and sanitary facilities.

II. IMPOUNDMENTS/Sludge:

A. No Action

The impoundment sludge would remain in place in the unlined main and secondary impoundments.

B. Excavate and reclaim

The sludge would be separated into commercially valuable creosote, water and solids. The creosote could potentially be sold, the water evaporated or managed with the impoundment water, and the solids disposed at an approved landfill. It is estimated that an 80 percent recovery rate could be attained.

C. Excavate, stabilize and dispose off-site

The sludge in the impoundment would be stabilized through the addition and mixing of physical and chemical stabilizing agents. The sludge would be mixed in place, with an equal volume of stabilizing agent. Once the sludge was solidified/stabilized, the material would be excavated and transported to a loading area for subsequent off-site disposal in an approved hazardous waste landfill.

D. Excavate and incinerate off-site

The sludge would be tested to determine the material compatibility with the off-site facility. The sludge would be solidified as needed for transportation. It would then be excavated and stockpiled for immediate bulk transport. The material would be incinerated in an off-site permitted facility.

E. Excavate and incinerate on-site

The sludge in the impoundments would be excavated and incinerated on-site using a mobile thermal incinerator. Some stabilization might be required to facilitate handling and loading the sludge. Three incinerator processes were evaluated: a rotary kiln, an infrared kiln, and a circulation bed system. These incinerator processes are discussed in detail in the revised Phase II RI/FS report. Residue (ash) from the process would be transported to a hazardous waste landfill.

II. IMPOUNDMENT/Oil:

A. No Action

The oil would remain on the surface of the main impoundment and would continue to inhibit evaporation of the water in that impoundment.

B. Pump from impoundment and treat (capture) with carbon adsorption

The oil would be skimmed off the surface of the main impoundment and pumped into the carbon adsorption system after treatment of the main impoundment water. It might be necessary to store the oil temporarily while the water treatment process is proceeding. The spent carbon would be reclaimed by the commercial provider of the carbon canister(s).

C. Pump from impoundment and incinerate on-site

The oil would be skimmed off the surface of the main impoundment and incinerated along with the impoundment sludge.

II. IMPOUNDMENT/Water:

A. No action

Impoundment water would remain in the main impoundment on a year-round basis, and in the secondary impoundment on a seasonal basis.

B. Evaporate in secondary impoundment

The main impoundment water would be pumped onto the upper crust of the secondary impoundment to depths not exceeding six inches and allowed to evaporate. It is assumed that this alternative would be undertaken during the dry part of the year and that the secondary impoundment would not contain an appreciable amount of water. It is also assumed that three applications of water would be required, based on the volume of water present and additional precipitation.

C. Treat with carbon adsorption; dispose on-site via evapo-transpiration

The water from the main impoundment would be treated to eliminate contaminants in a carbon adsorption system. The treated water would be discharged to a vegetated area of the site to be eliminated through evapotranspiration. The rate of discharge would be monitored and controlled so as not to exceed the evapotranspiration rate.

D. Pump to new lined pond and evaporate; incinerate liner

A new lined pond would be constructed on the site. The main impoundment water would be pumped into the pond for evaporation. The preferred period for evaporation would be from June through September when evaporation rates are the highest. At the end of use, the pond would be dismantled and the liner would be incinerated or disposed of in an appropriately permitted landfill.

E. Use as incineration quench water

The water would be used as quench water in the mobile incinerator used for the sludge and/or soils.

II. IMPOUNDMENT/Soil:

The RI/FS confirmed the existence of contaminated soil beneath the impoundments but did not define the extent or degree of that contamination. Consequently, the first operable unit will be restricted to addressing visibly contaminated soil. Other contaminated soils beneath the impoundments will be addressed during the Phase III RI/FS.

A. No action

The visibly contaminated soil would remain beneath and around the impoundments.

B. Excavate and dispose off-site

The visibly contaminated soil would be excavated with backhoe digging equipment and front end loaders. Soil requiring stabilization due to residual sludge or water would be solidified by mixing with kiln dust, alpha portland cement or possilime to meet the paint filter test required for transportation and disposal. The soil could be temporarily stockpiled prior to loading in trucks for disposal. The soil would be transported as bulk shipments to an approved hazardous waste landfill. Truck scales and a decontamination pad would be constructed on site.

C. Excavate and biodegrade on-site

The visibly contaminated soil beneath and around the impoundments would be excavated and treated on the site using an engineered biodegradation system (EBDS). The EBDS is a unit process for immobilizing and biologically degrading compounds using soil as the medium for growing and maintaining the necessary microorganisms. The major components of this system consist of treatment and storm water control units.

D. Excavate and manage on-site (temporary waste pile)

The visibly contaminated soil beneath and around the impoundments would be excavated and stockpiled in an isolated area of the impoundment. The ultimate disposition of the soils would be determined or resolved as part of the final solution for the entire site

E. Excavate and incinerate on-site

Samples of contaminated soil would be tested to demonstrate compatibility with the incineration process. The visibly contaminated soil beneath and around the impoundments would be excavated and incinerated on the site using the mobile incinerator used for the impoundment sludge. It is likely that the soil would be mixed with the sludge and/or oil prior to incineration.

F. Excavate and incinerate off-site

Samples of contaminated soil would be tested to assure compatibility with facility criteria. The visibly contaminated soil beneath and around the impoundments would be excavated. Soils requiring stabilization due to residual sludge or other liquids would be stabilized prior to transportation. The soil could be temporarily stockpiled prior to loading in trucks for disposal. The soil would be transported as bulk shipments to an approved hazardous waste incinerator. Truck scales and a decontamination pad would be constructed on site.

III. FACILITY AREA/Firewater:

Treatment options for the "firewater" would also apply to other contaminated water found or generated during building/structure decontamination process.

A. No action

The firewater would remain in its present locations in the basement of the treatment plant and/or vessel(s) on the site.

B. Filter asbestos fibers; filters disposed in hazardous waste facility

The firewater would be filtered to remove any asbestos fibers. The filter would be appropriately packaged and disposed in a facility licensed to accept asbestos fibers. Further treatment of the water is discussed below.

C. Evaporate in secondary impoundment

Contaminated water would be pumped to the secondary impoundment in depth not to exceed six inches and allowed to evaporate. This alternative includes an assumption that it would take place during a dry time of year (June through October), and that the secondary impoundment would not contain an appreciable amount of water.

D. Treat with carbon adsorption; dispose on-site via evapo-transpiration

Contaminated water would be pumped through an activated carbon adsorption unit. The treated water would be sampled and analyzed periodically to verify the effectiveness of the process. The treated water would be discharged to the eastern portion of the site at a rate not to exceed the evapo-transpiration rate.

E. Pump to new lined pond and evaporate; incinerate liner

A new lined pond would be constructed on the site. The firewater would be pumped into the pond for evaporation. The preferred period for evaporation would be from June through September when evaporation rates are the highest. At the end of use, the pond would be dismantled and the liner would be incinerated or disposed of in an appropriately permitted landfill. It is likely that the evaporation pond would be the same one used for the main impoundment water.

F. Use as incineration quench water

The contaminated water would be used as quench water in the mobile incinerator while incineration of the sludge and/or soils proceeds.

III. FACILITY AREA/Buildings:

A. No action

The existing site structures would be left in place and evaluated later as part of the final solution.

B. Demolish, decontaminate and dispose of debris in an approved landfill

The treatment plant and shop buildings on the site would be demolished (razed). Asbestos and asbestos contaminated material would be segregated and disposed of in an appropriate hazardous waste landfill. Building debris would be cleaned with a high-pressure water stream and tested for residual contamination. Debris that is no longer contaminated would be transported to an industrial landfill. Steel debris would be salvaged or disposed of as scrap after the decontamination process. Residual organic wastes would be treated according to their medium. Sludge-like material could be treated the same as the impoundment sludge, and water could be treated like the impoundment water. Removal activities involving asbestos will require adherence with state, federal and local regulations regarding asbestos handling protocol, which will impact the method of building demolition.

III. FACILITY AREA/Vessels:

As noted in Section C, the contents of vessels have not been fully characterized. In order to select cleanup alternatives for these vessels and/or their contents, further characterization will be necessary during the Phase III RI/FS.

A. No action

The vessels would be left in place with their contents, and would be further addressed during Phase III.

B. Dispose of contents appropriately

The contents of the vessels would be emptied with a hydraulic sludge pump and treated appropriately according to medium. Sludge-like materials would be treated like the impoundment sludge, with an emphasis on reclaiming product where possible. Contaminated water would be treated like the impoundment water.

C. Use as temporary storage

Usable vessels would be emptied of their contents, which would be tested and treated appropriately. The vessels would then be decontaminated with a high pressure water stream or solvent wash. The vessels would either remain in place or be moved to an area of the site where they might be used in future remediation tasks.

D. Demolish and dispose in a commercial industrial landfill

Vessels would be emptied of their contents, which would be tested and treated appropriately. After decontamination, the vessels would be cut into manageable sizes and loaded into roll-off boxes and/or dump trucks for transportation to an industrial or commercial landfill.

E. Demolish and transport to scrap yard

Vessels would be emptied of their contents, which would be tested and treated appropriately. After decontamination, the vessels would be cut into manageable sizes and loaded into roll-off boxes and/or dump trucks for transportation to a scrap yard.

IV. SURFACE SOILS/with Organic Contamination:

The Phase II RI/FS identified areas where surface soils contain elevated levels of organic contamination. However, the degree and extent of soil contamination have not been fully evaluated for the entire site. Additionally, an appropriate action level for cleanup of any soils other than those that are visibly contaminated remains to be determined. Consequently, all remedies addressing contaminated surface soils were eliminated during the initial screening process, and the only alternative that remained was "No action at this time."

A. No action at this time

The soils would remain in place and be the subject of further study during the Phase III RI/FS. There is insufficient information to support remedy selection at this time.

IV. SURFACE SOILS/with Metals Contamination:

The Phase II RI/FS identified areas where surface soils contain elevated levels of inorganic contamination. However, the degree and extent of soil contamination have not been fully evaluated for the entire site. Additionally, an appropriate action level for cleanup of soils remains to be determined. Consequently, all remedies addressing contaminated surface soils were eliminated during the initial screening process, and the only alternative that remained was "No action at this time."

A. No action at this time

The soils would remain in place and be the subject of further study during the Phase III RI/FS. There is insufficient information to support remedy selection at this time.

V. MONITORING

The performance of the implemented operable unit would be monitored both to assure that the remedies are effective and to comply with any associated ARARs. Specific monitoring activities cannot be identified until remedy design phase.

A. No action

No monitoring would take place.

B. Monitoring performance of implemented actions

A variety of remedy-specific monitoring procedures would be implemented, depending on the specific remedies selected:

- Monitoring of site access restrictions would be conducted via periodic site inspections;
- Temporary storage vessels, impoundments, etc. would be monitored regularly throughout their use.
- Air emissions and/or ash residues from any incineration process would be sampled and tested regularly to assure compliance with air standards and the effectiveness of the incineration process.
- The effluent from any liquid treatment process would be sampled and analyzed regularly to assure the effectiveness of the process.

5

C. Ground water monitoring

Monitoring to determine the nature and extent of ground water contamination would be conducted to achieve two purposes:

- Regularly scheduled monitoring of ground water would be used to establish baseline conditions against which future conditions would be compared to show the effectiveness of remedies.
- The Phase III RI/FS will include monitoring of contamination in the ground water as one of its primary objectives.

Detailed Evaluation Process

The remedial action alternatives that passed the initial screening process were further refined and evaluated in detail, as contemplated under Section 300.68(h) of the current NCP and in Directive Number 9355.0-19 of the Office of Solid Waste and Emergency Response (OSWER). This detailed analysis of each RAA was based on a set of nine criteria developed from the NCP and the new SARA language in CERCLA. These criteria relate directly to factors mandated in Section 121 of CERCLA, particularly Section 121(b)(1)(A-G). A major part of this evaluation of alternatives was in considering the mandate to utilize permanent solutions and alternative treatment technologies to the maximum extent practicable, as specified in Section 121 of CERCLA.

The nine criteria are listed and described in Table F-2.

ARARs Considerations

The Phase II RI/FS process included an analysis of applicable or relevant and appropriate requirements (ARARs) to determine which requirements the various remedies for this OU at the BWP site would have to meet. In this analysis, most ARARs were related to specific remedies rather than to contaminants or locations.

In general, many of the remedies that were considered involved the treatment, storage or disposal of listed and/or characteristic hazardous wastes. Consequently, the primary ARARs for this OU are Federal RCRA laws and regulations, or their State counterparts. The State of Colorado has been delegated RCRA authority; however, the State has yet to implement HSWA requirements. Therefore, for some remedial actions, federal RCRA requirements are more stringent and are the proper ARARs to be considered.

The specific ARARs considered for each remedial action alternative are listed in Table F-3. Some discussion of those ARARs follows:

For those remedies relating to Site Access, the applicable regulations for site security are found in 6 CCR 1007-3 Section 264.14. In particular, this section establishes minimum requirements for restricting site access to hazardous waste facilities.

The alternatives which address the contents of the Impoundments will generally involve the treatment or disposal of the listed K001 sludge. The water and oil in the impoundments is not a listed hazardous waste; however, these liquids contain hazardous constituents and the remedies were evaluated on the basis of their ability to treat these liquids as if they were a hazardous waste.

The impoundment remedies are all subject to specific design and operating requirements applicable to the particular remedies being evaluated. For incineration, these requirements are found at 6 CCR 1007-3 Part 264 Subpart O. For surface impoundments and waste piles, design and operating requirements are found in more stringent federal regulations in 40 CFR 264 Subparts K and L, respectively.

For the K001 sludge, HSWA Land Disposal Restrictions are applicable. In the May 17, 1988 Federal Register, draft regulations proposed the following treatment standards to define Best Demonstrated Available Technology (BDAT) for disposal of K001 waste after incineration:

Constituent	Total Composition (mg/kg)	TCLP (mg/l)
Naphthalene	7.98	na
Pentachlorophenol	36.75	na
Phenanthrene	7.98	na
Pyrene	7.28	na
Toluene	0.143	na
Xylenes	0.162	na
Copper	na	0.71
Lead	na	0.53
Zinc	na	0.066

For those remedies involving treatment of contaminated water, the provisions of 6 CCR Section 261.3 would apply to determining whether the water treated by carbon absorption is still a hazardous waste after such treatment. If the treated water is a hazardous waste as defined in the applicable regulations, then subsequent land treatment of the water would be subject to the requirements of 6 CCR 1007-3 Part 264 Subpart M.

In compliance with EPA's Offsite Policy, all alternatives which include off-site disposal of contaminants and treatment residues would be required to have such disposal occur at a licensed RCRA facility.

The treatment and disposal of asbestos is covered by State Regulation Number 8, which requires notification of the Air Pollution Control Division prior to undertaking asbestos removal activities. State Regulation Number 1 regulates fugitive dust emissions and would be applicable to any demolition process.

There may be other listed wastes in some of the vessels in the treatment facility area, and RCRA regulations are likely to list some other materials or wastes relating to the site in the near future.

Costs Analysis

Consistent with the CERCLA mandate for cost-effective remedies, all the RAAs were evaluated on the basis of cost-effectiveness. Costs associated with each of the remedies under consideration are summarized in Table F-4.

In comparing costs among different remedies, only remedies with similar results or main features have been compared.

Results of the Detailed Evaluation

The results of the detailed evaluation of each remedy against the nine criteria are found in Table F-5. The following discussion highlights the results presented in the table:

For the Site Access remedies, the Posting Notice remedy scored high, but it was noted that this could not be the sole component of the Site Access remedy. Fencing the entire site scored highest among the other remedies, particularly because of its overall protectiveness, implementability, and low cost.

Among the Impoundment remedies, On-Site Incineration was rated high for both the sludge and the oil based on its permanence, protectiveness, reduction of TMV, and relative low cost.

Carbon treatment, the new lined pond and the quench water options were all rated highly for addressing contaminated water, although there were some concerns about each of them.

Several RAAs scored high for addressing the impoundment soils, with on-site incineration and on-site management both showing favorable qualities because of permanence and implementability, respectively.

In the Facilities Area, the RAAs to treat the firewater were rated similarly to the Impoundment water RAAs. For the RAAs addressing both buildings and the vessels, no particular remedy stood out, mostly because of the unknowns associated with this segment of the site.

For the Surface Soils, the detailed analysis was severely hampered by the lack of information on the full nature and extent of the contamination in that medium.

Table F-1

LISTING OF INTERIM REMEDIAL ALTERNATIVES CONSIDERED FOR THE BRODERICK WOOD PRODUCTS SITE, ADAMS COUNTY, COLORADO[1]

SEGMENT/Problem	Alternatives
I. SITE ACCESS:	A. No action
	B. Posting notices
	C. Selective fencing
	D. Fencing entire site
	E. Security guards
II. IMPOUNDMENTS:	
Sludge	A. No action
	B. Excavate and reclaim
	C. Excavate, stabilize and dispose off-site
	D. Excavate and incinerate off-site
	E. Excavate and incinerate on-site
Oil	A. No action
	B. Pump from impoundment and treat (capture) with carbon adsorption
	C. Pump from impoundment and incinerate on-site
Water	A. No action
	B. Evaporate in secondary impoundment
	C. Treat with carbon adsorption: dispose on-site via evapo-transpiration
	D. Pump to new lined pond and evaporate; incinerate liner
	E. Use as incineration quench water
Soil	A. No action
	B. Excavate and dispose off-site
	C. Excavate and biodegrade on-site
	D. Excavate and manage on-site (temporary waste pile)
	E. Excavate and incinerate on-site
	F. Excavate and incinerate off-site

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(1) The alternatives listed are those that remained after the initial screening process; these alternatives were carried through the detailed analysis.

Table F-1 (cont'd)

LISTING OF INTERIM REMEDIAL ACTION ALTERNATIVES CONSIDERED FOR THE BRODERICK WOOD PRODUCTS SITE, ADAMS COUNTY, COLORADO[1]

SEGMENT/Problem	Alternatives
III. BUILDINGS, VESSELS, ETC.	
Firewater[2]	A. No action
	B. Filter asbestos fibers; filters disposed in hazardous waste facility
	C. Evaporate in secondary impoundment
	D. Treat with carbon adsorption; dispose on-site via evapo-transpiration
	E. Pump to new lined pond and evaporate; incinerate liner
	F. Use as incineration quench water
Buildings	A. No action
	B. Demolish, decontaminate and dispose of debris in an approved landfill
Vessels	A. No action
	B. Dispose of contents appropriately
	C. Use as temporary storage
	D. Demolish and dispose in a commercial industrial landfill
	E. Demolish and transport to scrap yard
IV. SURFACE SOILS Contaminated with:	
Organics	A. No action at this time
Metals	A. No action at this time
V. MONITORING	A. No action
	B. Monitoring performance of implemented actions
	C. Ground-water monitoring

(1) The alternatives listed are those that remained after the initial screening process; these alternatives were carried through the detailed analysis.

(2) Treatment options for "firewater" will also apply to other contaminated water found or generated during building/structure decontamination process.

Table F-2

ALTERNATIVE EVALUATION CRITERIA FOR INTERIM REMEDIES AT THE BRODERICK WOOD PRODUCTS COMPANY ADAMS COUNTY, COLORADO

1. Overall protection

This criterion evaluates how the alternative eliminates, reduces, or controls existing and potential risks to human health and the environment through treatment, engineering contols, and/or institutional controls.

2. Compliance with ARARs

This criterion considers the ability of each RAA to attain chemical-specific, location-specific, and action-specific applicable or relevant and appropriate requirements (ARARs); also considered are other criteria, advisories, and guidances. If a waiver is to be invoked, the justification for that waiver will be discussed.

3. Permanence

Under this criterion, the evaluation compares the magnitude of total residual risk in terms of untreated waste and treatment residuals. This criterion also covers the adequacy and suitability of engineering and institutional controls used to manage untreated waste and treatment residuals. The criterion also considers the reliability of the alternative over time, including the potential for failure and the resulting potential risk.

4. Reduction of TMV (toxicity, mobility, or volume)

This criterion includes an evaluation of the treatment process(es) and the kinds and amounts of waste material to be treated. The evaluation considers whether or not treatment is a principal element in the alternative, and how the treatment will reduce or destroy the waste. Other considerations include the degree (percentage) of treatment, degree of irreversibility and the kinds and amounts of residuals.

Table F-2 (cont'd)

ALTERNATIVE EVALUATION CRITERIA FOR INTERIM REMEDIES AT THE BRODERICK WOOD PRODUCTS COMPANY ADAMS COUNTY, COLORADO

5. Short-term effectiveness

Considerations under this criterion include: potential impacts on the community during implementation of the alternative; potential impacts on and protective measures for workers during implementation; potential environmental impacts and mitigation measures; and time until protection is achieved.

6. Implementability

This criterion includes the following considerations:

a. Technical Feasibility:

- Reliability of the technology
- Difficulties and unknowns associated with technology
- Ease of undertaking additional action, if necessary
- Consistency with future remedies at the site
- Reliability and effectiveness of remedy monitoring

b. Administrative Feasibility:

- Ability and time required to obtain permits/approvals
- Required coordination with other agencies and associated time requirements

c. Availability of services and materials

- Treatment, storage and disposal capacity
- Existence of multiple vendors
- Availability of needed equipment and specialists
- Timing of technology availability

7. Cost

This includes capital costs, operation and maintenance, and present worth analysis. When comparing different alternatives for costs, only alternatives with similar results will be compared.

Table F-2 (cont'd)

ALTERNATIVE EVALUATION CRITERIA FOR INTERIM REMEDIES AT THE BRODERICK WOOD PRODUCTS COMPANY ADAMS COUNTY, COLORADO

8. State acceptance

This criterion addresses those features of each alternative that the State supports, those features about which the State has reservations, and those elements which the State strongly opposes.

9. Community acceptance

This criterion addresses those features of each alternative that the community supports, those features about which the community has reservations, and those elements which the community strongly opposes.

Table F-3

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR INTERIM REMEDIAL ALTERNATIVES BRODERICK WOOD PRODUCTS SITE, ADAMS COUNTY, COLORADO[1]

SEGMENT/Problem/ Alternative	Applicable or Relevant and Appropriate Requirements
I. SITE ACCESS:	In general, ARARs are those state regulations found at 6 CCR 1007-3 Section 264.14. These regulations and their federal counterparts (40 CFR 264.14) require either 24-hour surveillance of the facility, or access restrictions such as fences, gates, signs, etc.
A. No action	Would not meet ARARs noted above.
B. Posting notices	Signs must be in English and any other predominant language; must be visible from ≥25 feet.
C. Selective fencing	Selective fencing would meet ARARs if extent of contamination could be well defined.
D. Fencing entire site	An option that would be consistent with the regulation, particularly if contamination is widespread.
E. Security guards	One of the options contained in the regulations.
II. IMPOUNDMENTS/Sludge	The sludge is listed as a waste (K001) under RCRA regulations, and is subject to land disposal restrictions.
A. No action	Would not comply with ARARs. Statutory requirement (Section 3005(j) of HSWA) requires all surface impoundments to be retrofitted to meet Section 3005(o) standards by November 8, 1988.
B. Excavate and reclaim	Product from reclaiming process would not be subject to RCRA regulations. RCRA land disposal restrictions would apply to residues from reprocessing the K001 sludge as of August 1988. Any residues to be disposed in a landfill would have to meet Best Demonstrated Available Technology (BDAT) standards, and the residues would likely contain excessive levels of penta and/or dioxins. If the sludge or residues need to be stored more than 90 days in an area other than the impoundments prior to reclaiming or disposal, the State and Federal regulations on surface impoundments (6 CCR 1007-3, 264 Subpart K and 40 CFR 264 Subpart K, 264.220-249, respectively) would be applicable. State regulations at 6 CCR 1007-3, Part 264, Subparts I and J would apply to the use of any containers and tanks during the reclaiming process.
C. Excavate, stabilize and dispose off-site	RCRA Land Disposal restrictions will apply to sludge as of August 1988. Any sludge to be disposed in a landfill would have to meet Best Demonstrated Available Technology (BDAT) standards; the excessive levels of penta and/or dioxins in the sludge will make it difficult to meet BDAT. If the sludge needs to be stored on-site in a new impoundment prior to transport, the State and Federal regulations on surface impoundments (6 CCR 1007-3, 264 Subpart K and 40 CFR 264 Subpart K, 264.220-249, respectively) would be applicable. RCRA manifest requirements (40 CFR 262, Subparts B, C) would apply to transporting the waste.

Table F-3 (cont'd)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR INTERIM REMEDIAL ALTERNATIVES BRODERICK WOOD PRODUCTS SITE, ADAMS COUNTY, COLORADO[1]

SEGMENT/Problem/ Alternative	Applicable or Relevant and Appropriate Requirements
II. IMPOUNDMENTS/Sludge (cont'd)	
D. Excavate and incinerate off-site	State and Federal regulations on incineration of RCRA/hazardous wastes are found at 6 CCR 1007-3, 264 Subpart O and 40 CFR 264 Subpart O (264.340-351), respectively and 40 CFR 270.62. The sludge would have to be taken to a licensed hazardous waste treatment facility. RCRA land disposal restrictions would apply to disposal of treatment residues. RCRA manifest requirements (40 CFR 262, Subparts B, C) would apply to transporting the waste.
E. Excavate and incinerate on-site	State and Federal regulations on incineration of RCRA/hazardous wastes are found at 6 CCR 1007-3, 264 Subpart O and 40 CFR 264 Subpart O (264.340-351), respectively, and 40 CFR 270.62. RCRA land disposal restrictions would apply to disposal of treatment residues, which will need to meet BDAT levels. The substantive requirements of State Air Pollution Control Regulations will also apply to operating and controlling the incinerator.
II. IMPOUNDMENTS/Oil	The oil in the main impoundment contains hazardous constituents. Although it is not a listed waste, the impoundment water will be treated as if it were a hazardous waste and EPA RCRA Land Disposal restrictions would be considered relevant and appropriate because of the penta and dioxin content.
A. No action	Would not meet ARARs.
B. Pump from impoundment and treat (capture) with carbon adsorption	RCRA Land Disposal requirements would apply to disposal of the carbon filter: the contents of the filter cylinder would have to meet BDAT levels before disposal.
C. Pump from impoundment and incinerate on-site	Applicable State and Federal regulations on incineration of RCRA/hazardous wastes are found at 6 CCR 1007-3, 264 Subpart O and 40 CFR 264 Subpart O (264.340-351), respectively. RCRA land disposal restrictions would be relevant and appropriate to disposal of treatment residues, if any remain from the incineration process.
II. IMPOUNDMENTS/Water	The water in the main impoundment is in immediate contact with the bottom sludge, which is a listed hazardous waste (K001) under RCRA. Additionally, the water contains hazardous constituents. Consequently, although it is not a listed waste, the impoundment water will be treated as if it were a hazardous waste.
A. No action	Would not meet ARARs.
B. Evaporate in secondary impoundment	The applicable requirements are those found in State and federal regulations on surface impoundments (6 CCR 1007-3, Subpart K and 40 CFR, Subpart K, 264.220-249, respectively).
C. Treat with carbon adsorption: dispose on-site via evapo-transpiration	State regulations for disposing the water on-site would require either treating the water to non-detectable levels for hazardous constituents or compliance with Land Treatment regulations found in 6 CCR 1007-3, Part 264, Subpart M. State regulations at 261.3 would apply to determining whether the treated water is still a hazardous waste.

Table F-3 (cont'd)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR INTERIM REMEDIAL ALTERNATIVES BRODERICK WOOD PRODUCTS SITE, ADAMS COUNTY, COLORADO[1]

SEGMENT/Problem/ Alternative	Applicable or Relevant and Appropriate Requirements
II. IMPOUNDMENTS/Water (cont'd)	
D. Pump to new lined pond and evaporate; incinerate liner	Applicable State and Federal regulations on surface impoundments, especially design considerations, are found at 6 CCR 1007-3 Part 264, Subpart K and 40 CFR Part 264, Subpart K (264.220-249), respectively. State and Federal regulations on incineration of RCRA/hazardous wastes are found at 6 CCR 1007-3, 264 Subpart O and 40 CFR 264 Subpart O (264.340-351), respectively and 40 CFR 270.62.
E. Use as incineration quench water	Applicable State and Federal regulations on incineration of RCRA/hazardous wastes are found at 6 CCR 1007-3, Part 264, Subpart O and 40 CFR Subpart O (264.340-351), respectively. RCRA land ban restrictions would be relevant and appropriate to disposal of treatment residues, if any remain from the incineration process.
II. IMPOUNDMENTS/Soil	The soils under the impoundments contains hazardous constituents and will be treated as if they were a hazardous waste.
A. No action	Would not meet ARARs.
B. Excavate and dispose off-site	The RCRA Land Disposal regulations and off-site policy would govern this alternative.
C. Excavate and biodegrade on-site	Applicable requirements would be State land treatment regulations found at 6 CCR 1007-3, Part 264, Subpart M. Additionally, Subparts F and G would also apply.
D. Excavate and manage on-site (temporary waste pile)	Two sets of regulations apply to this alternative: state regulations at 264 Subpart L (264.250-269) include requirements for either a single liner with ground water monitoring or a double liner and leak detection without ground water monitoring. Under parallel federal regulations (264.250-269), requirements are for a single liner and leachate collection system, 100 year storm protection, among other things.
D. Excavate and incinerate off-site	Applicable State and Federal regulations on incineration of RCRA/hazardous wastes are found at 6 CCR 1007-3, 264 Subpart O and 40 CFR 264 Subpart O (264.340-351), respectively, and 40 CFR 270.62. The soil would have to be taken to a licensed hazardous waste treatment facility. RCRA land disposal restrictions would apply to disposal of treatment residues. RCRA manifest requirements (40 CFR 262, Subparts B, C) would apply to transporting the waste.
E. Excavate and incinerate on-site	Applicable State and Federal regulations on incineration of hazardous wastes are found at 6 CCR 1007-3, 264 Subpart O and 40 CFR 264 Subpart O (264.340-351), respectively, and 40 CFR 270.62. RCRA land disposal restrictions would be relevant and appropriate to disposal of treatment residues, which will need to meet BDAT levels. The substantive requirements of State Air Pollution Control Regulations will also apply to operating and controlling the incinerator.

Table F-3 (cont'd)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR INTERIM REMEDIAL ALTERNATIVES BRODERICK WOOD PRODUCTS SITE, ADAMS COUNTY, COLORADO[1]

SEGMENT/Problem/ Alternative	Applicable or Relevant and Appropriate Requirements
III. FACILITY AREA/Firewater	The firewater has been in contact with hazardous constituents and contains hazardous constituents and will be treated as if it were a hazardous waste.
A. No action	Would not meet ARARs.
B. Filter asbestos fibers; filters disposed in hazardous waste facility	State Air Regulations for handling the asbestos-laden will apply. These requirements are found at Air Quality Control Commission Regulation Number 8.
C. Evaporate in secondary impoundment	The applicable requirements are those found in State and federal regulations on surface impoundments (6 CCR 1007-3, Subpart K and 40 CFR, Subpart K, 264.220-249, respectively).
D. Treat with carbon adsorption: dispose on-site via evapo-transpiration	State regulations for disposing the water on-site would be applicable and require either treating the water to non-detectable levels for hazardous constituents or compliance with Land Treatment regulations found in 6 CCR 1007-3, Part 264, Subpart M. State regulations at 261.3 would apply to determining whether the treated water is still a hazardous waste.
E. Pump to new lined pond and evaporate; incinerate liner	Applicable State and Federal regulations on surface impoundments, especially design considerations, are found at 6 CCR 1007-3 Part 264, Subpart K and 40 CFR Part 264, Subpart K (264.220-249), respectively. State and Federal regulations on incineration of RCRA/hazardous wastes are found at 6 CCR 1007-3, 264 Subpart O and 40 CFR 264 Subpart O (264.340-351), respectively and 40 CFR 270.62.
F. Use as incineration quench water	Applicable State and Federal regulations on incineration of RCRA/hazardous wastes are found at 6 CCR 1007-3, Part 264, Subpart O and 40 CFR Subpart O (264.340-351), respectively. RCRA land ban restrictions would be relevant and appropriate to disposal of treatment residues, if any remain from the incineration process.
III. FACILITY AREA/Buildings	
A. No action	Would not meet ARARs.
B. Demolish, decontaminate and dispose of debris in an approved landfill	State Regulations on handling and disposing of asbestos will apply. Additionally, Colorado Air Quality Control Regulation Number 1 will apply to controlling fugitive dust during the demolition process. The State considers any discarded chemical product to be F-listed waste, and such wastes dwould have to be removed from the debris prior to off-site disposal.
III. FACILITY AREA/Vessels	
A. No action	Would not meet ARARs.
B. Dispose of contents appropriately	The empty container rule at 40 CFR 261.7(b)(1) will apply to determinations of when a container is considered empty. Some of the contents may be F-listed wastes, to which "fast track" land disposal restrictions would apply after November 8, 1988. Such restrictions would require that disposed wastes or residues meet BDAT levels.

Table F-3 (cont'd)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR INTERIM REMEDIAL ALTERNATIVES BRODERICK WOOD PRODUCTS SITE, ADAMS COUNTY, COLORADO[1]

SEGMENT/Problem/ Alternative	Applicable or Relevant and Appropriate Requirements
III. **FACILITY AREA/Vessels** (cont'd)	
C. Use as temporary storage	State regulations at 264.170-177 would be applicable to use of storage tanks for storage. Also applicable would be 40 CFR 264.190-200 and state regulations 264.190-199.
D. Demolish and dispose in a commercial industrial landfill	Applicable State Regulations would be those that define the difference between hazardous and non-hazardous waste.
E. Demolish and transport to scrap yard	Applicable State Regulations would be those that define the difference between hazardous and non-hazardous waste.
IV. **SURFACE SOILS/Organics**	
A. No action at this time	A thorough review of ARARs will not be conducted until specific remedies are developed to address this problem.
IV. **SURFACE SOILS/Metals**	
A. No action at this time	A thorough review of ARARs will not be conducted until specific remedies are developed to address this problem.
V. **MONITORING**	
A. No action	Would not meet ARARs.
B. Monitoring performance of implemented actions	In general, each RAA listed above includes its own monitoring requirements.
C. Ground-water monitoring	If closure were invoked, Federal ground water monitoring requirements found at 40 CFR 264 Subpart F (264.90-100) would be relevant and appropriate.

(1) The alternatives listed are those that remained after the initial screening process; these alternatives were carried through the detailed analysis.

(2) Treatment options for "firewater" will also apply to other contaminated water found or generated during building/structure decontamination process.

Table F

COMPARISONS OF COSTS OF KEY ALTERNATIVES FOR OPERABLE UNIT AT BWP

SEGMENT/ Problem	Alternative	Cost[1]		Reference[2]	Comments
		Unit	Total ($1000)		
I. SITE ACCESS					
	A. No Action		0		
	B. Posting Notices stating: "Danger - Hazardous Waste - Unauthorized Personnel Keep Out"				
	signs legible at 50'	$20/ea	$0.4	C	
	signs legible at 125'	$125/ea	$2.5	A, pg. 4-22	
	C. Selective fencing			A, pg. 4-29	
	3500 feet	$10/ft	$35		
	D. Fence entire site			B, pg. 63	
	8750 feet	$8.75/ft	$76.6		
	2 gates 20' each	$18.75/ft	0.75		
	Total		$77.4		
	E. Security guards			A, pg. 4-32	
	24 hour surveillance	$9/hr	$197		Assumes 24 hour/day surveillance for two years.
II. IMPOUNDMENTS/					
Sludge (4000 yd^3)					Sludge volume estimated at 3600 yd^3 by ITC; figure rounded to 4000 by Keystone
	A. No Action		0		
	B. Excavate and reclaim			A, pg. 4-37	
	Remove, centrifuge 4000 yd^3	$325/$yd^3$	$1300		Backfill & cap noted by Keystone not included here. Residuals assumed to be 20% or 800yd^3.
	Residuals to landfill	$369/$yd^3$	$295		
	Total		$1595		

Table F-4 (cont'd)

COMPARISONS OF COSTS OF KEY ALTERNATIVES FOR OPERABLE UNIT AT BWP

SEGMENT/ Problem	Alternative	Cost[1]		Reference[2]	Comments
		Unit	Total ($1000)		
II. IMPOUNDMENTS/ (cont'd)					
Sludge (4000 yd^3) (cont'd)					Sludge volume estimated at 3600 yd^3 by ITC; figure rounded to 4000 by Keystone.
	C. **Excavate, stabilize and dispose off-site**			A, pg. 4-40	
	Stabilization material	$125/$yd^3$	$500		Assumes 4000 yd^3 stabilization material. Backfill & cap noted by Keystone not included here.
	Mix and remove 8000 yd^3	$62.5/$yd^3$	$500		
	Transport to landfill	$369/$yd^3$	$2950		
	Total	na	$3950		
	D. **Excavate and incinerate off-site**			A, pg. 4-43	
	Stabilization material	$125/$yd^3$	$500		
	Mix and remove 8000 yd^3	$62.5/$yd^3$	$500		Backfill & cap noted by Keystone not included here.
	Transport to incinerator	$156/$yd^3$	$1250		
	Incinerate	$312/$yd^3$	$2500		
	Total	na	$4750		
	E-1. **Excavate and incinerate on-site (Keystone)**			A, pg. 4-48	
	Sludge removal	$31/$yd^3$	$125		Backfill & cap noted by Keystone not included here.
	Engineering		$138		
	Incinerator contractor cost	281/ton	$1125		Keystone used 1.2 $tons/yd^3$; this figure is based on 1.0 ton/yd^3.
	Total		$1388		
	E-2. **Excavate and incinerate on-site (Jacobs)**				
	Sludge removal	$12/$yd^3$	$48	D	Backfill and cap noted by Keystone not included here. Cost includes test burn. Assumes 0.11 tons of ash/ton of sludge.
	Incinerate on-site	$497/$yd^3$	$1989	D	
	Dispose of 440 Tons of ash	$369/ton	$162	A, pg 4-40; D	
	Total		$2199		
Oil (approximately 3000 gallons)					
	A. **No Action**		0		

Table F-4 (co

COMPARISONS OF COSTS OF KEY ALTERNATIVES FOR OPERABLE UNIT AT BMP

SEGMENT/ Problem	Alternative	Cost[1]		Reference[2]	Comments
		Unit	Total ($1000)		
II. IMPOUNDMENTS/ (cont'd)					
Oil (cont'd)					
	B. Pump from impoundment and treat (capture) with carbon adsorption				
		$2.39/gal	$7.2	D	
	C. Pump from impoundment and incinerate on-site				
		$3.03/gal	$9.1	D	
Water (approximately 560,000 gallons in main impoundment)					Keystone estimate of 1.5 M gallons may be much greater than actual; this evaluation uses 560,000 gallons, based on Jacobs estimate.
	A. No Action		0		
	B. Evaporate in secondary impoundment			B, pg. 69	
	Pumping costs	$0.023/gal	$13		
	C. Treat with carbon adsorption; dispose on-site via evapo-transpiration				
	Carbon Treatment	$0.033/gal	$18.6	B, pg. 70; C	Carbon Treatment costs prorated based on volume from total of $20K. Assumes a system with one or two sprinkler heads. All pumping costs included here.
	Evapo-transpiration process	$0.0185/gal	$10.4	D	
	Total		$29.0		
	D. Pump to new lined pond and evaporate; incinerate liner				
	Build new pond (1.5 acres)		$191	A, pg. 4-69	
	Pump water to pond	$0.237/gal	$133	A, pg. 4-69	
	Incinerate liner		$5	D	Assumes liner weighs 2.5 lb/yd^2
	Total		$329		
	E. Use as incineration quench water				
	Pump to incinerator	$0.0063/gal	$3.5	D	Assumes incinerator equipped with holding tank.

Table F-4 (cont'd)

COMPARISONS OF COSTS OF KEY ALTERNATIVES FOR OPERABLE UNIT AT BMP

SEGMENT/ Problem	Alternative	Cost[1] Unit	Cost[1] Total ($1000)	Reference[2]	Comments
II. IMPOUNDMENTS/ (cont'd)					
Soils under the impoundments (volume estimated as large as 30,700 yd^3)					Volume is estimate of maximum; actual volume may be much less.
	A. No Action		$0		
	B. Excavate and dispose off-site				
	Excavate	$12.5/yd^3	$384		Backfill & cap noted by Keystone not included here. Assumes 31,000 yd^3 of soil.
	Transport to facility	$156.2/yd^3	$4796		
	Disposal	212.5/yd^3	$6524		
	Total		$11704		
	C. Excavate and biodegrade on-site			A, pg. 4-56	
	Excavate	$29/yd^3	$384		Backfill & cap noted by Keystone not included here. Assumes 30,700 yd^3 of soil.
	Biodegrade	16.35/yd^3	$502		
	Total		$886		
	D-1. Excavate and manage on-site (temporary waste pile) (Keystone estimate)				
	Excavate to lined area	$31.25/yd^3	$959	A, pg. 4-59	Backfill & cap noted by Keystone not included here
	D-2. Excavate and manage on-site (temporary waste pile) (Jacobs estimate)				
	Excavate half 2ndry impndmt	$10.5/yd^3	$108	B, D	Assumes 10,234 yd^3 under main impoundment, 20,466 yd^3 under secondary impoundment. Lined area would be 1.9 acres in 2ndary impoundment.
	Construct liner	na	$157	B, D	
	2ndary soils to liner	$10.5/yd^3	$215	B, D	
	Main soils to liner	$10.5/yd^3	$108	B, D	
	Cover		$157		
	Total		$745		
	E-1. Excavate and incinerate on-site (Keystone)			A, pg. 4-62	
	Excavate	$12.5/yd^3	$384		Backfill & cap noted by Keystone not included here. Assumes 31,000 yd^3 of soil to be incinerated.
	Incinerate	$342/yd^3	$10498		
	Total		$10882		

Table F-4 (co[illegible])

COMPARISONS OF COSTS OF KEY ALTERNATIVES FOR OPERABLE UNIT AT BMP

SEGMENT/ Problem	Alternative	Cost[1]		Reference[2]	Comments
		Unit	Total ($1000)		
II. IMPOUNDMENTS/ (cont'd)					
Soils under the impoundments (volume estimated as large as 30,700 yd^3) (cont'd)					Volume is estimate of maximum; actual volume may be much less.
	E-2. **Excavate and incinerate on-site** (Jacobs)			D	
	Excavate Incinerate 2500 yd^3 Total	\$10.5/yd^3 \$490/yd^3	\$52 \$1225 \$1277		Backfill & cap noted by Keystone not included here. Assumes only 2500 yd^3 to be incinerated. Disposal of residue not included.
	F. **Excavate and incinerate off-site**			A, pg. 4-65	
	Excavate Transport Disposal (incineration) Total	\$12.5/yd^3 \$156/yd^3 \$312.5/yd^3	\$384 \$4797 \$9594 \$14775		Backfill & cap noted by Keystone not included here. Assumes 30,700 yd^3 of soil.
III. FACILITY AREA (BUILDINGS, VESSELS, ETC.)					
Firewater: Cost estimates are all based on volume estimate of 40,000 from Keystone.					
	A. **No Action**				
	B. **Filter asbestos fibers; dispose filters in hazardous waste landfill**				
	Filter 40,000 gal	\$0.21/gal	\$8.4	A, pg. 4-73	Disposal of filter not included
	C. **Evaporate water in secondary impoundment**				
	pump water to impoundment	\$0.13/gal	\$0.5	D	
	D. **Treat with carbon adsorption; dispose on-site via evapo-transpiration**				
	Carbon Treatment Evapo-transpiration process Total	\$0.033/gal \$0.0185/gal	\$1.33 \$0.745 \$2.075	D, B, pg. 73 D	Carbon Treatment costs prorated based on volume from total of \$20K. Assumes a system with one or two sprinkler heads. All pumping costs included here.

Table F-4 (cont'd)

COMPARISONS OF COSTS OF KEY ALTERNATIVES FOR OPERABLE UNIT AT BMP

SEGMENT/		Cost[1]			
Problem	Alternative	Unit	Total ($1000)	Reference[2]	Comments
III. FACILITY AREA (BUILDINGS, VESSELS, ETC.) (cont'd)					
Firewater (cont'd)					
	E. Pump to new lined pond and evaporate; incinerate liner				
	Build pond, pump water to it	$1.28/gal	$51	A, pg. 4- 69	Assumes separate pond from impoundment water pond. Cost would decrease significantly if combined with impoundment water. Assumes liner weighs 0.75 tons.
	Incinerate liner	$490/ton	$0.4		
	Total		$51.4		
	F. Use as incineration quench water				
	Pump to incinerator	$0.013/gal	$0.5	D	Assumes incinerator equipped with holding tank.
Buildings:	The extent of remediation for this problem needs to be defined in greater detail regarding the degree to which the debris can be decontaminated.				
	A. No Action at this time		0		
	B. Demolish, decontaminate and dispose of debris in an approved landfill		$458	A, pg. 4-81	Includes asbestos, debris and associated contamination and sludge removal and disposal.
Vessels:	The extent of remediation for this problem needs to be defined in greater detail regarding the contents of the vessels and the degree to which the debris can be decontaminated.				
	A. No Action at this time		0		
	B. Dispose of contents appropriately		unknown		
	C. Use as temporary storage		$219	A, pg 4-85	
	D. Demolish and dispose in a commercial industrial landfill		$325	A, pg 4-87	

Table F-4 (cor ')

COMPARISONS OF COSTS OF KEY ALTERNATIVES FOR OPERABLE UNIT AT BMP

SEGMENT/ Problem	Alternative	Cost[1] Unit	Cost[1] Total ($1000)	Reference[2]	Comments
III. FACILITY AREA (BUILDINGS, VESSELS, ETC.) (cont'd)					
Vessels (cont'd):					
	E. Demolish and transport to scrap yard		$294	A, pg 4-89	
IV. SURFACE SOILS contaminated with:					
Organics	A. No Action		$0	B,	Not enough information to select remedy; will be determined during Phase III RI/FS
Metals	A. No Action		$0	B,	Not enough information to select remedy; will be determined during Phase III RI/FS

Table F-4 (cont'd)

COMPARISONS OF COSTS OF KEY ALTERNATIVES FOR OPERABLE UNIT AT BWP

SEGMENT/ Problem	Alternative	Cost[1] Unit	Cost[1] Total ($1000)	Reference[2]	Comments
V. MONITORING: In general, costs of monitoring operable unit will be determined in greater detail during design stage.					
Site Access					
	periodic inspection of perimeter/signs		unknown		
Impoundments					
	Incineration: stack testing,		unknown		Testing will accord with Colorado Regulations
	Staging areas: leachate monitoring		unknown		
	sampling treated water				Will be main focus of Phase III RI/FS.
	ground water monitoring				
Facility Area					
	Sampling of treated firewater		unknown		Will be conducted in Phase III RI/FS.
	Further characterization of the buildings and vessels.		unknown		
Surface Soils					
	Will be investigated further during Phase III RI/FS				

Notes:

1 - All costs include a 25% contingency fee.

2 - References:

A - "Revised Phase II RI/FS" by Keystone, July 1987
B - "Supplemental RI/FS Information" by Jacobs, November 1987
C - Jacobs communication to EPA, December 15, 1987
D - Jacobs Letter Report dated June 15, 1988

Table F-5

EVALUATION OF INTERIM REMEDIAL ACTION ALTERNATIVES FOR THE BRODERICK WOOD PRODUCTS COMPANY ADAMS COUNTY, COLORADO

SEGMENT/Problem Alternative/ Criterion	Evaluation
I. SITE ACCESS	
A. No action	
1. Overall protection	Would not be protective. Unauthorized trespassers and others would continue to be exposed to contamination.
2. Compliance with ARARs	Would not comply.
3. Permanence	Not applicable.
4. Reduction of TMV	No reduction of TMV.
5. Short-term effectiveness	Not effective in short term.
6. Implementability	Not applicable.
7. Cost	No cost.
8. State acceptance	State would not accept.
9. Community acceptance	Community not likely to accept.
B. Posting notices	
1. Overall protection	Would alert public of potential danger from contamination, but not sufficient alone. Would not control site access,
2. Compliance with ARARs	Signs legible at 50 feet will exceed regulatory requirement, which says legible at 25 feet. Signs may need to be in Spanish as well as English. This alternative will comply with ARARs, but will not be sufficient by itself.
3. Permanence	Not a permanent remedy.
4. Reduction of TMV	Helps reduce potential for toxicity to impact people by warning them to stay away. Would not reduce actual TMV associated with the site.
5. Short-term effectiveness	Effective for short term.
6. Implementability	Easily implementable.
7. Cost	Very low cost: $400.
8. State acceptance	Acceptable to State, provided not the sole remedy for this problem area.
9. Community acceptance	No negative response from community.
C. Selective fencing	
1. Overall protection	Would minimize contact only with known areas of contamination; may not address other areas not yet known.
2. Compliance with ARARs	Would not comply with ARARs unless extent of contamination was well defined.

Table F-5 (cont'd)

EVALUATION OF INTERIM REMEDIAL ACTION ALTERNATIVES FOR THE BRODERICK WOOD PRODUCTS COMPANY ADAMS COUNTY, COLORADO

SEGMENT/Problem Alternative/ Criterion	Evaluation
I. SITE ACCESS (cont'd)	
C. Selective fencing (cont'd)	
3. Permanence	Not a permanent remedy.
4. Reduction of TMV	Helps reduce potential for toxicity by restricting public access to contamination. Would not reduce actual TMV associated with the site.
5. Short-term effectiveness	Would be effective for those areas fenced; not protective for unknown areas of contamination.
6. Implementability	Relatively easy to implement. May not be consistent with future remedies which could require fences to be moved.
7. Cost	Lesser short term expense than fencing entire site: however, costs may increase significantly if fences need to be moved for future remedies or if other contaminated areas are found.
8. State acceptance	State favors fencing entire site.
9. Community acceptance	No negative reaction.
D. Fencing entire site	
1. Overall protection	Very protective site access control measure; would limit access to all areas of contamination, including areas not yet fully characterized.
2. Compliance with ARARs	Would comply fully with ARARs.
3. Permanence	Not a permanent remedy.
4. Reduction of TMV	Helps reduce potential for toxicity by restricting public acces to contamination. Would not reduce actual TMV associated with the site.
5. Short-term effectiveness	Very effective site access option.
6. Implementability	Relatively easy to implement. Likely to be consistent with future remedies which may require access to various parts of the site.
7. Cost	More costly than selective fencing in short term; however, may be less costly in long term, particularly if remedies or future studies (Phase III) were to show need to move or expand fencing option.
8. State acceptance	The State prefers this option.
9. Community acceptance	Most likely to be acceptable to community. The PRP has agreed to this option.

Table F-5 (cont'd)

EVALUATION OF INTERIM REMEDIAL ACTION ALTERNATIVES
FOR THE BRODERICK WOOD PRODUCTS COMPANY
ADAMS COUNTY, COLORADO

SEGMENT/Problem Alternative/ Criterion	Evaluation
I. SITE ACCESS (cont'd)	
E. Security guards	
1. Overall protection	Most protective of site access remedies. Would provide greatest assurance that no unauthorized persons would gain access to the site and be exposed to the contamination.
2. Compliance with ARARs	Would comply with ARARs.
3. Permanence	Not a permanent remedy.
4. Reduction of TMV	Helps reduce potential for toxicity by restricting public access to contamination. Would not reduce actual TMV associated with the site.
5. Short-term effectiveness	Would be very effective in short term. However, guards would need hazard/safety training to avoid exposure to contamination.
6. Implementability	Implementable, but not as easily implemented as other site access remedies.
7. Cost	Rather high cost for this problem area: almost $200,000
8. State acceptance	State would accept as remedy.
9. Community acceptance	Community would likely support this remedy.
II. IMPOUNDMENTS/Sludge	
A. No action	
1. Overall protection	Not protective. Sludge would remain in impoundments as the largest concentration of contamination on the site.
2. Compliance with ARARs	Would not comply with ARARs.
3. Permanence	Not applicable.
4. Reduction of TMV	Would not reduce TMV.
5. Short-term effectiveness	Not effective in short term.
6. Implementability	Not applicable.
7. Cost	No immediate cost.
8. State acceptance	State would not accept.
9. Community acceptance	Community not likely to accept. No action at this time preferred by the PRP.
B. Excavate and reclaim	
1. Overall protection	There could be some difficulty in separating penta and dioxins from creosote. There remains some doubt about the level of contaminants in the product and how protective this alternative would be.

Table F-5 (cont'd)

EVALUATION OF INTERIM REMEDIAL ACTION ALTERNATIVES FOR THE BRODERICK WOOD PRODUCTS COMPANY ADAMS COUNTY, COLORADO

SEGMENT/Problem Alternative/ Criterion	Evaluation
II. IMPOUNDMENTS/Sludge (cont'd)	
B. Excavate and reclaim (cont'd)	
2. Compliance with ARARs	Compliance with ARARs questionable; penta and dioxins in sludge and residues could make it impossible to reuse creosote or comply with new RCRA Land Disposal Regulations.
3. Permanence	Would permanently address much of sludge. However, dioxins would remain in recovered creosote and residues. Residues proposed for disposal rather than destruction.
4. Reduction of TMV	Would greatly reduce TMV of sludge. However, penta and dioxins would remain in recovered creosote and residues.
5. Short-term effectiveness	Some risk associated with disturbing, handling sludge.
6. Implementability	Technically implementable and feasible. No certainty that product is saleable.
7. Cost	$1.6 million.
8. State acceptance	State would accept if all ARARs could be attained with certainty.
9. Community acceptance	No negative reaction
C. Excavate, stabilize and dispose off-site	
1. Overall protection	Not as protective as remedies that include destruction of contaminants.
2. Compliance with ARARs	Presence of penta, dioxins, and other contaminants in sludge and oil would make it difficult to comply with RCRA Land Disposal restrictions.
3. Permanence	Would require long term monitoring and/or management at the disposal site.
4. Reduction of TMV	Would reduce mobility, not volume or toxicity. Does not include treatment or destruction of contamination as a principal element.
5. Short-term effectiveness	Some risk associated with disturbing, handling and transporting sludge.
6. Implementability	Not difficult to implement.
7. Cost	$4.0 million: more costly than other, more permanent alternatives.
8. State acceptance	State would not accept unless ARARs could be met.
9. Community acceptance	Community reaction unknown.
D. Excavate and incinerate off-site	
1. Overall protection	Very protective remedy.

Table F-5 (cont'd)

EVALUATION OF INTERIM REMEDIAL ACTION ALTERNATIVES
FOR THE BRODERICK WOOD PRODUCTS COMPANY
ADAMS COUNTY, COLORADO

SEGMENT/Problem Alternative/ Criterion	Evaluation
II. IMPOUNDMENTS/Sludge (cont'd)	
D. **Excavate and incinerate off-site** (cont'd)	
2. Compliance with ARARs	Compliance with ARARs fully attainable.
3. Permanence	A permanent remedy that would leave little long-term risk.
4. Reduction of TMV	Significant reduction in TMV. The remedy would employ destruction of contaminants as a principal element.
5. Short-term effectiveness	Potential risks associated with transportation of material to off-site incinerator.
6. Implementability	Reliable, demonstrated technology.
7. Cost	$4.8 million. Cost greater than on-site incineration due to transportation of materials to incinerator.
8. State acceptance	State would accept if all ARARs complied with.
9. Community acceptance	Local community likely to accept.
F. **Excavate and incinerate on-site**	
1. Overall protection	Very protective.
2. Compliance with ARARs	Compliance with ARARs fully attainable.
3. Permanence	A permanent remedy that would leave little long-term risk.
4. Reduction of TMV	Significant reduction in TMV. This remedy employs destruction of contaminants as principal element. Treatment (destruction) efficiency in greater than 99%.
5. Short-term effectiveness	Some short-term risks associated with disturbing and handling sludge. Minimal risk associated with air emissions.
6. Implementability	Reliable, demonstrated, technically feasible remedy.
7. Cost	At $1.4 to 2.2 million, the cost of this RAA is much less than off-site incineration.
8. State acceptance	State will accept provided ARARs met.
9. Community acceptance	No adverse reaction from community.
II. IMPOUNDMENTS/Oil	
A. **No action**	
1. Overall protection	Not protective: oil would remain on-site as potential hazard.
2. Compliance with ARARs	Would not comply with ARARs.

Table F-5 (cont'd)

EVALUATION OF INTERIM REMEDIAL ACTION ALTERNATIVES FOR THE BRODERICK WOOD PRODUCTS COMPANY ADAMS COUNTY, COLORADO

SEGMENT/Problem Alternative/ Criterion	Evaluation
II. IMPOUNDMENTS/Oil (cont'd)	
A. No action (cont'd)	
3. Permanence	Not a permanent remedy.
4. Reduction of TMV	Would not reduce TMV.
5. Short-term effectiveness	Not applicable.
6. Implementability	Not applicable.
7. Cost	No direct costs.
8. State acceptance	State would prefer a remedy.
9. Community acceptance	Community would prefer a remedy.
B. Pump from impoundment and treat (capture) with carbon adsorption	
1. Overall protection	Very protective. A major source of contamination at the site would be remedied with this RAA.
2. Compliance with ARARs	Would comply with ARARs.
3. Permanence	A remedy that would permanently reduce the long-term risk associated with this problem.
4. Reduction of TMV	Recovery process for carbon filter would effectively reduce TMV of oil. Treatment is a principal element of this RAA.
5. Short-term effectiveness	Would be very effective in the short term: some short term risks associated with disturbing and handling the oil.
6. Implementability	Very easy to implement, particularly if carbon adsorption implemented for water treatment. However, it may be preferable either to keep the carbon filter process exclusively for water treatment, or to treat the oil last, after the water has been treated.
7. Cost	Low cost ($7,200), particularly if carbon adsorption implemented for water treatment.
8. State acceptance	State would accept this RAA, provided all ARARs attained.
9. Community acceptance	No negative reaction.
C. Pump from impoundment and incinerate on-site	
1. Overall protection	Very protective. A major source of contamination at the site would be remedied with this RAA.
2. Compliance with ARARs	Would comply with ARARs.
3. Permanence	A remedy that would permanently reduce the long-term risk associated with this problem.

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Table F-5 (cont'd)

EVALUATION OF INTERIM REMEDIAL ACTION ALTERNATIVES
FOR THE BRODERICK WOOD PRODUCTS COMPANY
ADAMS COUNTY, COLORADO

SEGMENT/Problem Alternative/ Criterion	Evaluation
II. IMPOUNDMENTS/Oil (cont'd)	
C. **Pump from impoundment and incinerate on-site** (cont'd)	
4. Reduction of TMV	This RAA includes treatment of contamination (destruction efficiency greater than 99%) as a principal element. TMV would be effectively reduced.
5. Short-term effectiveness	Would be very effective in the short term; some short term risks associated with disturbing and handling the oil.
6. Implementability	Very easy to implement if incineration implemented for sludge. This method may be preferable to using carbon treatment so that carbon can be used longer for contaminated water.
7. Cost	Low cost ($9,100), if incineration implemented for sludge.
8. State acceptance	State would accept this RAA, provided all ARARs attained.
9. Community acceptance	No negative reaction.
II. IMPOUNDMENTS/Water	
A. **No action**	
1. Overall protection	Not protective: water would remain on-site as potential hazard and would interfere with potential remedies for other contents of the impoundments.
2. Compliance with ARARs	Would not comply with ARARs.
3. Permanence	Not a permanent remedy.
4. Reduction of TMV	Would not reduce TMV.
5. Short-term effectiveness	Not applicable.
6. Implementability	Not applicable.
7. Cost	No direct costs.
8. State acceptance	State would prefer a remedy.
9. Community acceptance	Community would prefer a remedy.
B. **Evaporate in secondary impoundment**	
1. Overall protection	Overall protection would be achieved only after treatment of sludge in impoundment. Small potential for water to aggravate ground water contamination problems if pond surface not sealed.
2. Compliance with ARARs	Secondary impoundment not lined, would not meet ARARs

Table F-5 (cont'd)

EVALUATION OF INTERIM REMEDIAL ACTION ALTERNATIVES FOR THE BRODERICK WOOD PRODUCTS COMPANY ADAMS COUNTY, COLORADO

SEGMENT/Problem Alternative/ Criterion	Evaluation
II. IMPOUNDMENTS/Water (cont'd)	
B. **Evaporate in secondary impoundment** (cont'd)	
3. Permanence	Does not provide permanent remedy by itself; subsequent treatment of sludge would be permanent for contaminants in water.
4. Reduction of TMV	Does not directly treat TMV of contaminants: contaminants would remain in Secondary impoundment and be treated with sludge.
5. Short-term effectiveness	Small potential for water to aggravate ground water contamination: abnormal weather could cause some uncertainty about how long remedy would take.
6. Implementability	Remedy easy to implement. Some potential for abnormal weather events to lengthen time of remedy.
7. Cost	Low cost remedy for impoundment water ($13,000).
8. State acceptance	State would concur only if ARARs could be achieved.
9. Community acceptance	Unknown.
C. **Treat with carbon adsorption; dispose on-site via evapo-transpiration**	
1. Overall protection	Very protective.
2. Compliance with ARARs	Would comply with ARARs if treatment reduced hazardous constituents to non-detectable levels. If non-detect levels not achievable, may need to waive ARARs and treat below SDWA MCLs.
3. Permanence	A permanent remedy: hazardous contaminants captured on carbon filter will be destroyed in filter regeneration process.
4. Reduction of TMV	Would significantly reduce TMV.
5. Short-term effectiveness	Very effective in short term.
6. Implementability	Treatment process is a reliable, demonstrated technology. Discharge and evapo-transpiration process will require close monitoring. Would also allow the greatest flexibility for scheduling disposal of impoundment water and treatment of other contaminated water (decon water) generated during other/future remedies.
7. Cost	A low cost option ($29,000).
8. State acceptance	State will accept provided ARARs met (treat to non-detect), and provided ET rate managed closely.
9. Community acceptance	No negative reaction, provided ET rate managed closely to prevent "mounding" of ground water.

Table F-5 (cont'd)

EVALUATION OF INTERIM REMEDIAL ACTION ALTERNATIVES FOR THE BRODERICK WOOD PRODUCTS COMPANY ADAMS COUNTY, COLORADO

SEGMENT/Problem Alternative/ Criterion	Evaluation
II. IMPOUNDMENTS/Water (cont'd)	
D. Pump to new lined pond and evaporate; incinerate liner	
1. Overall protection	Very protective alternative.
2. Compliance with ARARs	Compliance attainable.
3. Permanence	A permanent remedy. Would eliminate total risk associated with this contamination.
4. Reduction of TMV	Treatment and destruction of contaminants would be principal element of alternative.
5. Short-term effectiveness	Would be effective in short term. Would require significant movement of soils in constructing the new impoundment.
6. Implementability	Technology not difficult to implement. New pond may be useful as part of storage/treatment options for other (future) contaminated water.
7. Cost	Most costly of water treatment options. $329,000.
8. State acceptance	State would accept if all ARARs achievable.
9. Community acceptance	Community would accept.
E. Use as incineration quench water	
1. Overall protection	Would be protective provided there were not high levels of organic constituents in water. Some potential for organics to volatilize and escape via air pathway.
2. Compliance with ARARs	Compliance with ARARs achievable.
3. Permanence	Would be a permanent remedy, provided method to capture volatilized organics in water could be implemented.
4. Reduction of TMV	Treatment (destruction) of some contaminants would be a principal element of this RAA.
5. Short-term effectiveness	Would be effective in the short term.
6. Implementability	Technically feasible. Could be coordinated with incineration of sludge and/or soil, if schedules could be coordinated.
7. Cost	Very little cost ($3,500): may need water storage pond to hold water during incineration process.
8. State acceptance	Would accept provided ARARs attainable.
9. Community acceptance	Unknown.

Table F-5 (cont'd)

EVALUATION OF INTERIM REMEDIAL ACTION ALTERNATIVES FOR THE BRODERICK WOOD PRODUCTS COMPANY ADAMS COUNTY, COLORADO

SEGMENT/Problem Alternative/ Criterion	Evaluation
II. IMPOUNDMENTS/Soil	
A. No action	
1. Overall protection	Not protective; soil would remain on-site as potential hazard in contact with ground water regime.
2. Compliance with ARARs	Would not comply with ARARs.
3. Permanence	Not a permanent remedy.
4. Reduction of TMV	Would not reduce TMV.
5. Short-term effectiveness	Not applicable.
6. Implementability	Not applicable.
7. Cost	No direct costs.
8. State acceptance	State would prefer a remedy.
9. Community acceptance	Community would prefer a remedy.
B. Excavate and dispose off-site	
1. Overall protection	Very protective of human health and environment.
2. Compliance with ARARs	Compliance attainable, unless dioxins are present in levels greater than BDAT would allow for disposal.
3. Permanence	Threat to site would be permanently addressed; however, disposal site would require long-term management and monitoring.
4. Reduction of TMV	TMV of contaminants would be eliminated at the site. There would be some reduction of mobility due to disposal process; no reduction of toxicity or volume.
5. Short-term effectiveness	Potential risks associated with disturbing, handling and transporting material to disposal facility. Relatively short time to complete remedy.
6. Implementability	Technically reliable and a demonstrated, feasible remedy.
7. Cost	Very costly. $11.7 million.
8. State acceptance	State would accept provided all ARARs met.
9. Community acceptance	Local acceptance likely.
C. Excavate and biodegrade on-site	
1. Overall protection	Uncertain as to whether the level of treatment would be adequate for future uses of the site.
2. Compliance with ARARs	Compliance with Land Treatment ARARs attainable.
3. Permanence	Some potential for failure, i.e., remedy may not be able to meet cleanup goals. Would permanently address some contamination.

Table F-5 (cont'd)

EVALUATION OF INTERIM REMEDIAL ACTION ALTERNATIVES
FOR THE BRODERICK WOOD PRODUCTS COMPANY
ADAMS COUNTY, COLORADO

SEGMENT/Problem Alternative/ Criterion	Evaluation
II. IMPOUNDMENTS/Soil (cont'd)	
C. **Excavate and biodegrade on-site** (cont'd)	
4. Reduction of TMV	Would reduce TMV of contaminants at the site, and reduce direct contact risks. However, degree of TMV reduction not certain, particularly if dioxins are present.
5. Short-term effectiveness	Potential risks from disturbing and handling soils. Would require about one year to complete remedy.
6. Implementability	Technical feasibility has not been demonstrated with sufficient degree of reliability, particularly to meet stringent cleanup goals.
7. Cost	Relatively inexpensive. $886,000.
8. State acceptance	State would accept if all ARARs achievable.
9. Community acceptance	Unknown.
D. **Excavate and manage on-site** (temporary waste pile)	
1. Overall protection	Would reduce potential for contaminants to migrate during period of storage, but not a permanent solution.
2. Compliance with ARARs	Compliance attainable.
3. Permanence	Not a permanent remedy. Permanent remedy would have to be developed during future studies.
4. Reduction of TMV	Would reduce mobility during period of storage. Would not reduce toxicity or volume.
5. Short-term effectiveness	Would be very effective in the short term reduction of mobility.
6. Implementability	Reliable, easily implemented remedy. Monitoring would be required during storage period. Would be consistent with future remedies by revealing subsurface contamination.
7. Cost	Relatively inexpensive. $959,000.
8. State acceptance	State would concur, provided ARARs met.
9. Community acceptance	No negative reaction from community.
E. **Excavate and incinerate on-site**	
1. Overall protection	Very protective. Would destroy contamination source, and eliminate risks from these soils.
2. Compliance with ARARs	Compliance attainable.
3. Permanence	A permanent remedy. No long-term management or monitoring required.
4. Reduction of TMV	Destruction of contaminants would be principal element of remedy. There would be greater than 99% reduction in TMV. Residuals would be ash.

Table F-5 (cont'd)

EVALUATION OF INTERIM REMEDIAL ACTION ALTERNATIVES
FOR THE BRODERICK WOOD PRODUCTS COMPANY
ADAMS COUNTY, COLORADO

SEGMENT/Problem Alternative/ Criterion	Evaluation
II. IMPOUNDMENTS/Soil (cont'd)	
E. Excavate and incinerate on-site (cont'd)	
5. Short-term effectiveness	Close monitoring of incinerator operation would be required. Potential risks from disturbing and handling soils. Relatively short time until permanent remedy achieved. Minor air quality impacts.
6. Implementability	Uncertain until volume of soils is determined. Larger volume (>2,500 yd^3) of soils not feasible if small incinerator selected for sludge incineration.
7. Cost	Not certain. Range of costs from $1.3 million to $10.9 million, depending on volume of soil to be incinerated.
8. State acceptance	Acceptable to state, provided ARARs achieved.
9. Community acceptance	No negative reaction.
F. Excavate and incinerate off-site	
1. Overall protection	Very protective. Would destroy contamination source, and eliminate risks from these soils.
2. Compliance with ARARs	Compliance attainable.
3. Permanence	A permanent remedy. No long-term management or monitoring required.
4. Reduction of TMV	Destruction of contaminants would be principal element of remedy. There would be close to 100% reduction in TMV.
5. Short-term effectiveness	Close monitoring of incinerator operation would be required. Potential risks from disturbing, handling and transporting soils. Relatively short time until permanent remedy achieved. Minor air quality impacts at incinerator site.
6. Implementability	Technically feasible. A known, reliable remedy.
7. Cost	Most expensive permanent soils remedy. $14.8 million to incinerate up to 31,000 yd^3.
8. State acceptance	Acceptable to state, provided ARARs achieved.
9. Community acceptance	No negative local reaction.
III. FACILITY AREA/Firewater	
A. No action	
1. Overall protection	Not protective; water would remain on-site as potential hazard, and would interfere with other potential remedies for the facilities area.
2. Compliance with ARARs	Would not comply with ARARs.
3. Permanence	Not a permanent remedy.

Table F-5 (cont'd)

EVALUATION OF INTERIM REMEDIAL ACTION ALTERNATIVES
FOR THE BRODERICK WOOD PRODUCTS COMPANY
ADAMS COUNTY, COLORADO

SEGMENT/Problem Alternative/ Criterion	Evaluation
III. **FACILITY AREA/Firewater** (cont'd)	
A. **No action** (cont'd)	
Reduction of TMV	Would not reduce TMV.
Short-term effectiveness	Not applicable.
6. Implementability	Not applicable.
7. Cost	No direct costs.
8. State acceptance	State would prefer a remedy.
9. Community acceptance	Community would prefer a remedy.
B. **Filter asbestos fibers**	
1. Overall protection	Necessary to remove asbestos as source. Would eliminate risk from asbestos in water.
2. Compliance with ARARs	Compliance attainable. Filters would be treated (disposed) as hazardous waste in licensed landfill.
3. Permanence	A permanent remedy.
4. Reduction of TMV	Would eliminate TMV of asbestos in water.
5. Short-term effectiveness	Very effective in short term. Little time to implement.
6. Implementability	Easy to implement. Known, reliable technology.
7. Cost	Low cost. $8,400
8. State acceptance	Acceptable to state
9. Community acceptance	No negative reaction.
C. **Evaporate water in secondary impoundment**	
1. Overall protection	Overall protection would be achieved only after treatment of sludge in impoundment. Small potential for water to aggravate ground water contamination problems if pond surface not sealed.
2. Compliance with ARARs	Secondary impoundment not lined, would not meet ARARs
3. Permanence	Does not provide permanent remedy by itself; subsequent treatment of sludge would be permanent for contaminants in water.
4. Reduction of TMV	Does not directly treat TMV of contaminants: contaminants would remain in Secondary impoundment and be treated with sludge.
5. Short-term effectiveness	Small potential for water to aggravate ground water contamination: abnormal weather could cause some uncertainty about how long remedy would take.

Table F-5 (cont'd)

EVALUATION OF INTERIM REMEDIAL ACTION ALTERNATIVES
FOR THE BRODERICK WOOD PRODUCTS COMPANY
ADAMS COUNTY, COLORADO

SEGMENT/Problem Alternative/ Criterion	Evaluation
III. FACILITY AREA/Firewater (cont'd)	
C. Evaporate water in secondary impoundment	
6. Implementability	Remedy easy to implement. Some potential for abnormal weather events to lengthen time of remedy.
7. Cost	Low cost remedy ($500).
8. State acceptance	State would concur only if ARARs could be achieved.
9. Community acceptance	Unknown.
D. Treat with carbon adsorption; dispose on-site via evapo-transpiration	
1. Overall protection	Very protective. Would eliminate this contamination source.
2. Compliance with ARARs	Would comply with ARARs if treatment reduced hazardous constituents to non-detectable levels. If non-detectable levels not achievable, may need to waive ARARs and treat below SDWA MCLs.
3. Permanence	A permanent remedy; hazardous contaminants captured on carbon filter will be destroyed in filter regeneration process.
4. Reduction of TMV	Would significantly reduce TMV.
5. Short-term effectiveness	Very effective in short term.
6. Implementability	Treatment process is a reliable, demonstrated technology. Discharge and evapo-transpiration process will require close monitoring. Would also allow the greatest flexibility for scheduling disposal of this water and treatment of other contaminated water (decon water) generated during other/future remedies.
7. Cost	A low cost option ($2,000).
8. State acceptance	State would accept provided ARARs met (treat to non-detect), and provided ET rate managed closely.
9. Community acceptance	No negative reaction, provided ET rate managed closely to prevent "mounding" of ground water.
D. Pump to new lined pond and evaporate; incinerate liner	
1. Overall protection	Very protective alternative.
2. Compliance with ARARs	Compliance attainable.
3. Permanence	A permanent remedy. Would eliminate total risk associated with this contamination.
4. Reduction of TMV	Treatment and destruction of contaminants would be principal element of alternative.

Table F-5 (cont'd)

EVALUATION OF INTERIM REMEDIAL ACTION ALTERNATIVES
FOR THE BRODERICK WOOD PRODUCTS COMPANY
ADAMS COUNTY, COLORADO

SEGMENT/Problem Alternative/ Criterion	Evaluation
III. FACILITY AREA/Firewater (cont'd)	
D. Pump to new lined pond and evaporate; incinerate liner (cont'd)	
5. Short-term effectiveness	Would be effective in short term. Would require significant movement of soils in constructing the new impoundment.
6. Implementability	Technology not difficult to implement. New pond may be useful as part of storage/treatment options for other (future) contaminated water.
7. Cost	Most costly of firewater treatment options. $51,400.
8. State acceptance	State would accept if all ARARs achievable.
9. Community acceptance	Community would accept.
F. Use as incineration quench water	
1. Overall protection	Would be protective provided there were not high levels of organic constituents in water. Some potential for organics to volatilize and escape via air pathway.
2. Compliance with ARARs	Compliance with ARARs achievable.
3. Permanence	Would be a permanent remedy, provided method to capture volatilized organics in water could be implemented.
4. Reduction of TMV	Treatment (destruction) of some contaminants would be a principal element of this RAA.
5. Short-term effectiveness	Would be effective in the short term.
6. Implementability	Technically feasible. Could be coordinated with incineration of sludge and/or soil.
7. Cost	Very little cost ($3,500); may need water storage pond to hold water during incineration process.
8. State acceptance	Would accept provided ARARs attainable.
9. Community acceptance	Unknown.
III. FACILITY AREA/Structures:	As indicated below, EPA has concluded that not enough information exists to support selection of a remedy to address the buildings in the facility area. EPA believes that such information could be gathered in a relatively short period of time after this Record of Decision, and be documented in either the Phase III RI/FS or a separate study to support a removal action.
A. No action	
1. Overall protection	Full extent of risks have not yet been defined.
2. Compliance with ARARs	ARARs have not yet been determined.

Table F-5 (cont'd)

EVALUATION OF INTERIM REMEDIAL ACTION ALTERNATIVES
FOR THE BRODERICK WOOD PRODUCTS COMPANY
ADAMS COUNTY, COLORADO

SEGMENT/Problem Alternative/ Criterion	Evaluation
III. FACILITY AREA/Structures (cont'd)	
A. No action (cont'd)	
3. Permanence	Not a permanent remedy.
4. Reduction of TMV	No reduction of TMV.
5. Short-term effectiveness	Not effective.
6. Implementability	Not applicable.
7. Cost	No direct costs.
8. State acceptance	State would not accept.
9. Community acceptance	Community would prefer a remedy.
B. Demolish, decontaminate and dispose of debris in an approved landfill	
1. Overall protection	Full nature and extent of contamination and risks have not yet been defined. Unable to define how well this remedy might address those risks.
2. Compliance with ARARs	ARARs have not yet been determined.
3. Permanence	Potentially a permanent remedy.
4. Reduction of TMV	Potentially a great reduction of TMV.
5. Short-term effectiveness	Potentially very effective.
6. Implementability	Not yet determined: dependent on contents.
7. Cost	Not yet fully defined. The cost of this RAA has been augmented up to 250% because of damage from the July 1985 fire. Estimates range from $260,000 to $800,000.
8. State acceptance	State would prefer a remedy, once the nature and extent of contamination is better defined, and compliance with ARARs can be assured.
9. Community acceptance	Community would prefer a remedy.
III. FACILITY AREA/Vessels	EPA has also concluded that not enough information exists at this time to support selection of a remedy to address the vessels and their contents. EPA believes that such information could be gathered in a relatively short period of time after this Record of Decision, documented in either the Phase III RI/FS or a separate study to support a removal action.
A. No action	
1. Overall protection	Full extent of risks have not yet been defined.
2. Compliance with ARARs	ARARs have not yet been determined.

Table F-5 (cont'd)

EVALUATION OF INTERIM REMEDIAL ACTION ALTERNATIVES
FOR THE BRODERICK WOOD PRODUCTS COMPANY
ADAMS COUNTY, COLORADO

SEGMENT/Problem Alternative/ Criterion	Evaluation
III. **FACILITY AREA/Vessels** (cont'd)	
A. **No action** (cont'd)	
3. Permanence	Not a permanent remedy.
4. Reduction of TMV	No reduction of TMV.
5. Short-term effectiveness	Not effective.
6. Implementability	Not applicable.
7. Cost	No direct costs.
8. State acceptance	State would prefer a remedy, once nature and extent of contamination better defined.
9. Community acceptance	Community would prefer a remedy.
B. **Dispose of contents appropriately**	
1. Overall protection	Full nature and extent of contamination and risks have not yet been defined. Unable to define how well this remedy might address those risks.
2. Compliance with ARARs	ARARs have not yet been determined.
3. Permanence	Potentially a permanent remedy.
4. Reduction of TMV	Potentially a great reduction of TMV.
5. Short-term effectiveness	Potentially very effective.
6. Implementability	Not yet determined; dependent on contents.
7. Cost	Not defined.
8. State acceptance	State would prefer a remedy, once the nature and extent of contamination is better defined, and compliance with ARARs can be assured.
9. Community acceptance	Community would prefer a remedy.
C. **Use for temporary storage of liquids**	
1. Overall protection	Probably would not contribute directly to protectiveness. Could potentially contribute to other remedies.
2. Compliance with ARARs	Compliance with ARARs attainable.
3. Permanence	Not applicable.
4. Reduction of TMV	Not applicable.
5. Short-term effectiveness	Not applicable.
6. Implementability	Easily implementable; would likely contribute to other remedies.
7. Cost	Estimated at $219,000.

Table F-5 (cont'd)

EVALUATION OF INTERIM REMEDIAL ACTION ALTERNATIVES FOR THE BRODERICK WOOD PRODUCTS COMPANY ADAMS COUNTY, COLORADO

SEGMENT/Problem Alternative/ Criterion	Evaluation
III. **FACILITY AREA/Vessels** (cont'd)	
C. **Use for temporary storage of liquids** (cont'd)	
8. State acceptance	Acceptable to the State, provided ARARs are achieved.
9. Community acceptance	No negative reaction.
D. **Demolish and dispose in a commercial industrial landfill**	
1. Overall protection	Potentially very protective, provided ARARs are met.
2. Compliance with ARARs	Compliance attainable.
3. Permanence	Potentially a permanent remedy.
4. Reduction of TMV	Could significantly reduce TMV.
5. Short-term effectiveness	Implementation would be short term.
6. Implementability	Easily implementable.
7. Cost	Estimated at $325,000.
8. State acceptance	State would accept provided ARARs are met.
9. Community acceptance	No negative reaction.
E. **Demolish and transport to scrap yard**	
1. Overall protection	Potentially very protective, provided ARARs are met.
2. Compliance with ARARs	Compliance attainable.
3. Permanence	Potentially a permanent remedy.
4. Reduction of TMV	Could significantly reduce TMV.
5. Short-term effectiveness	Implementation would be short term.
6. Implementability	Easily implementable.
7. Cost	Estimated at $325,000.
8. State acceptance	State would accept provided ARARs are met.
9. Community acceptance	No negative reaction.
IV. SURFACE SOILS/with Organic Contamination	
A. No action	EPA has concluded that the current level of information about surface soils contaminated by organics is not sufficient to support selection of a remedy at this time. It is EPA's intent that the Phase III RI/FS will address the unknowns relating to surface soils. Consequently, a full evaluation of surface soil remedies was not conducted for this ROD.

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Table F-5 (cont'd)

EVALUATION OF INTERIM REMEDIAL ACTION ALTERNATIVES
FOR THE BRODERICK WOOD PRODUCTS COMPANY
ADAMS COUNTY, COLORADO

SEGMENT/Problem Alternative/ Criterion	Evaluation
IV. SURFACE SOILS/with Metals Contamination	
A. No action	EPA has concluded that the current level of information about surface soils contaminated by metals is not sufficient to support selection of a remedy at this time. It is EPA's intent that the Phase III RI/FS will address the unknowns relating to surface soils. Consequently, a full evaluation of surface soil remedies was not conducted for this ROD.
V. MONITORING	Because the actual monitoring activities to be conducted under the OU will not be determined until the design phase of remedy implementation, EPA has not conducted a detailed analysis of the monitoring RAAs. In many instances, monitoring is included in the remedies discussed above.
A. No action	
B. Monitoring performance of implemented actions	
C. Ground-water monitoring	

G. COMMUNITY INVOLVEMENT

1. EPA'S COMMUNITY INVOLVEMENT PROGRAM FOR THE BWP SITE

In compliance with the requirements of CERCLA and the NCP, EPA and the State of Colorado have conducted a program to keep nearby residents and other individuals with an interest in the BWP site informed about the ongoing studies and proposed remedies. This program has included the following:

a. Developing a list of all nearby residents and other persons interested in activities at the site.

b. Working with municipal and other local agencies to keep government officials informed about site issues and activities.

c. Establishing repositories of key information relating to the site, including RI/FS reports, the proposed plan, comments, responses and other documents so that the public would have ready access to the information.

d. Preparing and distributing news releases of significant events during the ongoing activities at the site.

e. Meeting with nearby residents, neighbors and local officials to discuss any concerns that they may have.

f. Mailing two Fact Sheets to all individuals on the mailing list. The first Fact Sheet, in January 1987, described the site and ongoing RI/FS activities. The second Fact Sheet, in December 1987, announced EPA's proposed plan for an interim remedy at the BWP site.

g. Announcing the proposed plan in a local newspaper so that persons not on the mailing list might be informed.

h. Conducting a public comment period on the proposed plan. The comment period was from February 10 through March 4, 1988. A public meeting was held near the site on February 22, 1988.

i. Responding to the comments received during the public comment period and at the public meeting.

j. Conducting a domestic well sampling program to determine whether any site-related contaminants had reached any of the off-site wells.

2. COMMUNITY CONCERNS AT THE BWP SITE

The level of interest in the community about the BWP site has been relatively low. This has been due primarily to the industrial character of much of the surrounding properties and the relatively sparse residential population nearby.

Approximately 25 people attended the public meeting during the comment period on the proposed plan. Written comments on the proposed plan were received from only a few individuals and/or companies. These comments showed that community concerns were generally related to the following major topics:

a. Much concern has been voiced by owners of property immediately adjacent to the BWP site because of their concern about impacts from the site. Of particular note was the concern that either current site conditions or some component of the preferred remedy would exacerbate the potential for ground water or other contamination to move off-site to the north. These concerns were related to, among other things, the preferred remedy to dispose of treated water on-site through evapo-transpiration.

b. Another significant concern was that contamination that may have already moved off-site should be addressed as soon as possible, and that the interim remedies being considered should not interfere with Phase III studies and remedy implementation.

c. There were also some concerns about the impact of Fisher Ditch on the site, both as a impediment and as an aid to off-site migration of contaminants.

d. BIC and its consultants have offered voluminous technical comments on the preferred remedy. Their basic objection to the remedy was that it was premature to select incineration for addressing either the sludge or the soils. BIC's comments are documented more thoroughly in the Administrative Record and will not be discussed in detail in this portion of the ROD.

Other community concerns relating to the ongoing Phase III RI/FS, the details of remedy implementation, remedy costs and monitoring are discussed in detail in the attached Community Involvement Responsiveness Summary.

EPA RESPONSE TO COMMUNITY CONCERNS

EPA's responses to individual concerns and issues raised during the public comment period are presented in the attached Community Involvement Responsiveness Summary. Of particular note are the following:

a. EPA's proposed remedy was designed to decrease the potential impact of the BWP site on the adjacent properties. Built into the water disposition remedy, for example, is the mechanism that water will be applied at less than the evapo-transpiration rate for the site.

b. EPA shares the community's concern that Phase III of the RI/FS should proceed without interference from the proposed plan, and has selected remedies that will meet this criterion. None of the remedy components should interfere with Phase III.

   EPA recognizes that the off-site contamination to be characterized in the Phase III RI/FS will likely be of greater impact than the contamination being addressed by this OU, and it is EPA's intent to have the Phase III RI/FS proceed as expeditiously as possible. However, EPA believes that it is prudent to remedy some of these very concentrated sources of contamination as soon as possible.

c. EPA concurs that the relationship of Fisher Ditch with the site's ground water regime has yet to fully characterized, and intends for this to be addressed in the Phase III RI/FS.

d. EPA's responses to BIC's comments on the preferred remedy are presented in detail in the Administrative Record and summarized in Chapter J, Rationale for the Selected Remedy.

Other EPA responses to public comments are presented in the attached Community Involvement Responsiveness Summary report.

H. CHANGES SINCE THE PROPOSED PLAN

1. THE PROPOSED PLAN

On February 10, 1988, EPA published and solicited comment on its proposed plan and preferred remedy for interim cleanup of the contamination at the BWP site. The preferred remedial alternative included:

- erecting a security fence around the entire site;
- posting warning signs around the perimeter;
- excavating and incinerating the impoundment sludge and oil;
- treating the contaminated water in the main impoundment with carbon adsorption and disposing of it on-site;
- excavating and either incinerating or stockpiling the visibly contaminated soils under the impoundments;
- filtering the "firewater" to remove asbestos fibers, treating the filtered water in the carbon adsorption unit and disposing of the treated water on-site;
- demolishing the treatment plant and shop buildings; and
- monitoring the performance of the remedies.

2. CHANGES SINCE THE PROPOSED PLAN

There have been a few changes since EPA's publishing of the Proposed Plan. Most of the changes have resulted from new information received by EPA since the plan was published. The changes include the following:

a. EPA has decided to address all contaminated water at the site, including both the water in the main impoundment and the firewater, by combining the preferred carbon adsorption treatment option with a new disposal method. The new disposal method will be using the treated water as incineration quench water. EPA is retaining as its second option the treatment of the water with carbon adsorption, followed by on-site evapo-transpiration.

b. EPA has refined its decision on the volume of visibly contaminated soils beneath the main and secondary impoundments. The cutoff volume for incineration of these soils will be 2,500 yd^3. If the volume of visibly contaminated soils is determined to be larger than this, the entire volume of soils will be stored temporarily on-site in a RCRA waste pile, while the Phase III RI/FS proceeds.

c. EPA has concluded that not enough information is available to support selection of a remedy in the Facilities Area, particularly for the buildings and vessels. EPA believes that such information could be gathered in a relatively short period of time after this Record of Decision, and a removal-type of remedy could be implemented at that time.

d. There have also been a few minor changes in the cost of the preferred remedy, as EPA has refined the cost information for some of the components.

3. RECENT INFORMATION

After the close of the public comment period, BIC submitted new data and information concerning the bioreclamation remedial alternative and asked EPA to consider this remedy for addressing the impoundment contents. In the Phase II RI/FS, BIC had presented bioreclamation as an alternative for soils, but not for impoundment sludge.

EPA has reviewed this information and has concluded that there is insufficient cause at this time to make significant changes in the selected remedy based on the new data. EPA concurs that bioreclamation is a viable alternative for soils, and expects this RAA to be a major focus of the Phase III RI/FS. However, EPA has concluded that this new information is not sufficient to support a change in the remedy for the impoundment sludge. Most of the information submitted by BIC concerns bioreclamation of contaminated soils rather than sludge. Selection of bioreclamation for sludge would have required much more extensive feasibility study work and data showing its effectiveness for such a heavy concentration of contaminants.

I. DESCRIPTION OF THE SELECTED REMEDY

Based on the currently available RI/FS information, EPA has concluded that several remedial action alternatives (RAAs) are necessary to protect human health, welfare, and the environment, and should be implemented as an "operable unit" at the BWP site. All of the remedies fall within the scope of the source control and direct contact measures contemplated by the revised and supplemental RI/FS reports.

Consistent with the earlier parts of this document, the selected remedies will be presented using the five segment process discussed previously. A summary table of the selected remedies and their associated costs is presented in Table I-1.

1. SITE ACCESS

EPA has concluded that access to the site should be restricted by a full security fence around the entire site. The fence should be a six-feet high chain link security type fence with three strands of barbed wire on top.

EPA is also selecting the posting of 20 signs with the warning "Danger - Hazardous Waste - Unauthorized Personnel Keep Out" to provide an additional deterrent to site entry. The signs will be legible from 50 feet, and will be in English.

The cost of the fence and warning signs is estimated at $77,800.

2. IMPOUNDMENTS

EPA has concluded that the contents of the main and secondary impoundments should be removed and treated to mitigate their potential to contribute further contamination to the site or off-site environment.

a. Main and Secondary Impoundment Sludge

The remedy that EPA is selecting to address the approximately 4000 yd^3 of sludge in the main and secondary impoundments is to remove the sludge from the impoundments and incinerate them in an on-site mobile thermal incinerator. The residue (ash) from this process will be tested to assure that it meets BDAT levels and then shipped to a permitted hazardous waste landfill.

For the residue from incineration of K001 wastes to meet BDAT, the maximum for any single grab sample must not exceed:

Constituent	Total Composition (mg/kg)	TCLP (mg/l)
Naphthalene	7.98	na
Pentachlorophenol	36.75	na
Phenanthrene	7.98	na
Pyrene	7.28	na
Toluene	0.143	na
Xylenes	0.162	na
Copper	na	0.71
Lead	na	0.53
Zinc	na	0.066

The ability of the incineration ash to meet these levels will be confirmed during a test burn of the sludge. It is possible that some stabilization of the ash will be required if the levels are not achievable without stabilization.

The remedy will be designed to achieve compliance with all applicable or relevent and appropriate state and federal regulations, particularly those pertaining to operation of incinerators. Although a permit will not be required, the remedy will have to meet the substantive requirements of the regulations.

The implementation of this remedy will also be closely coordinated with the appropriate federal and state air pollution control authorities to assure that applicable air pollution controls and monitoring measures are implemented during the incineration process. This will include whatever stack testing and quality assurance procedures are appropriate for the incineration process.

Cost estimates for this remedy are variable, depending on the source, and range from $1.4 to $2.2 million.

b. Main Impoundment Oil

EPA is selecting on-site incineration as the remedy to address the approximately 3000 gallons of oil on the surface of the main impoundment. The oil would be mixed with and incinerated with the main and secondary impoundment sludge. Residues from this process would be mixed in with the sludge residues and would be handled the same as the ash from the sludge.

The cost of incinerating the oil would be approximately $9,100.

c. Main Impoundment Water

EPA's preferred remedy for the contaminated water in the main impoundment is to treat the water in a carbon adsorption filtration unit and then use the water as quench water for the incineration process. The used carbon filters would be regenerated or disposed in an approved landfill. It is possible that a small storage pond may have to be built as part of the treatment plant.

It is anticipated that the treated water will have little or no contamination in it when it is added as quench water. If there is any contamination, it would mix with the residues of the sludge and be handled accordingly.

EPA is keeping the option of treating the water with a carbon adsorption unit and discharging it on the site through an above-ground sprinkler system. As part of this remedy the rate of application would not exceed the evapo-transpiration rate.

If the on-site discharge remedy is to be implemented, a pilot test will be conducted beforehand to determine whether the contaminants in the water would be reduced to non-hazardous levels. The goal would be to reduce the hazardous constituents in the water to non-detectable levels to comply with State ARARs. If non-detectable levels could not be met, EPA would waive the ARARs and treat to Maximum Concentration Limits (MCLs) under the Safe Drinking Water Act. The basis for this waiver would be that this is an interim remedy. More discussion of this issue is contained in Chapter J.

The quench water remedy would cost about $22,000 (including the carbon treatment), while the on-site discharge option would cost about $29,000 (including the carbon treatment).

d. Visibly contaminated soils beneath the impoundments

EPA has concluded that the visibly contaminated soils beneath the main and secondary impoundments should be removed from contact with the ground water regime, and is selecting two different remedies to address this contamination. Only one of the remedies will be implemented. The choice of which option to implement will be based on information to be gathered during the design stage of the remedy.

The key piece of information that needs to be gathered is the actual volume of the visibly contaminated soil. As noted earlier in this document, there are currently insufficient data to determine the volume of the visibly contaminated soils beneath the impoundments. The volume has been estimated to be as large as 31,000 yd^3.

EPA is therefore including a decision tree in the selection of a remedy for these soils. The two options, and the conditions on which they are based, are:

1. **If the volume of the visibly contaminated soils does not exceed 2,500 yd^3:**

   The soils would be excavated and incinerated on-site, using the same small-quantity mobile unit being used for the impoundment sludge and oil. The ash from the process would be tested and either disposed on-site or shipped to a hazardous waste landfill.

   The cost of the incineration option is estimated at $1.3 million.

2. **If the volume of the visibly contaminated soils does exceed 2,500 yd^3:**

   The soils will be excavated and managed on-site in a temporary waste pile, stockpiling them on a temporary liner in the secondary impoundments. In compliance with State ARARs, this liner will be a single liner with a leachate collection system. There will be a flexible synthetic membrane cover over the pile.

   The cost of this second option has been estimated to range from $745,000 to $959,000. These costs would be reduced significantly if the volume were significantly less than the highest estimate of 30,700 yd^3.

The actual volume of visibly contaminated soil will be estimated during remedial design with information from soil borings and will be determined with certainty when the overburden is removed during remedial activities. The depression left by removal of the soils would not be backfilled (except where the stockpile is located) to allow access to other (less than visibly contaminated) soils under the impoundments.

3. FACILITY AREA (BUILDINGS, VESSELS, ETC.)

a. Firewater

EPA has concluded that the "firewater" problem should be remedied as part of this first operable unit at the BWP site. The remedies selected and described below will also apply to any other contaminated water that may be produced or generated during the building demolition and decontamination process.

The "firewater" will be filtered to remove any asbestos fibers. The filter will be disposed of in a landfill licensed for such disposal.

The filtered water will then be treated using the same activated carbon adsorption filter system used for the impoundment water. The treated water will also be disposed of in the same manner as the treated impoundment water discussed above: it will either be used as quench water for the mobile incinerator or discharged on-site to a vegetated portion of the site for evapo-transpiration. The rate of application will be regulated not to exceed the natural evapo-transpiration capacity of the area.

The cost of the asbestos filtration portion of this RAA will be about $8,400. The cost of either carbon treatment/disposal option would be an additional $2,000.

b. Buildings

EPA has concluded that not enough information exists to support selection of a remedy to address the buildings in the facility area. EPA believes that such information could be gathered in a relatively short period of time after this Record of Decision, documented in either the Phase III RI/FS or a separate study to support a removal action.

c. Vessels

EPA has also concluded that not enough information exists at this time to support selection of a remedy to address the vessels and their contents. EPA believes that such information could be gathered in a relatively short period of time after this Record of Decision, documented in either the Phase III RI/FS or a separate study to support a removal action.

4. SURFACE SOILS/with Organics or Metals Contamination

EPA has concluded that the current level of information about surface soils contaminated by either organics or metals is not sufficient to support selection of a remedy at this time. It is EPA's intent that the Phase III RI/FS will address the unknowns relating to surface soils.

In the interim, EPA believes that the security fencing selected as part of the first operable unit will effectively limit the potential for human exposure to surface contamination.

5. MONITORING

EPA has concluded that environmental monitoring will be necessary during implementation of the selected remedies to ensure the RAAs successfully reduce or eliminate threats or potential threats to human health and the environment posed by the BWP site. The major purposes of the monitoring program will be to:

a. assure the effectiveness of each specific remedy implemented. For example, there will regular testing of treatment process discharges, such as incinerator stack emissions, and carbon adsorption treatment plant effluent. There will also be regular inspections and monitoring of any impoundments, waste piles, etc. that are implemented as part of the operable unit.

b. evaluate the overall effect of the operable unit on contaminant migration associated with ground water. The most significant parts of this program will be the continuing monitoring of ground water to the north and the monitoring for ground water mounding where treated water would be discharged on-site.

The actual details of the monitoring program will be developed during the design stage of remedy implementation, and will be based on the specific remedial actions taken. The monitoring program is likely to be developed in conjunction with the Phase III RI/FS. The most significant part of the Phase III study will be the ground water monitoring program to determine the extent of contaminant migration both on and off the site.

In many instances, the costs associated with monitoring a specific remedy have been included in the cost of the remedy. However, in other cases, the costs associated with a monitoring program are dependent on the specific actions included in the operable unit. Until those factors are determined, costs cannot be estimated.

Table I-1

SUMMARY OF BWP INTERIM REMEDIES SELECTED BY EPA

SEGMENT/ Problem	Selected Remedy	Cost Range ($)	
		Low	High
SITE ACCESS	Install Security Fence around entire site boundary. (chain link, 6' tall, topped with 3 strands of barbed wire)	77,400	77,400
	Post 20 signs stating "Danger - Hazardous Waste - Unauthorized Personnel Keep Out" (legible at 50 feet)	400	400
IMPOUNDMENTS/			
Sludge	Excavate and incinerate on-site; dispose of ash at hazardous waste landfill.	1,400,000	2,200,000
Oil	Incinerate on-site; residues will be mixed with residue (ash) from sludge incineration.	9,000	9,000
Water	Treat with carbon adsorption process and use as incinerator quench water; or	22,000	
	Treat with carbon adsorption process and dispose on-site via evapo-transpiration.		29,000
Soil	Incinerate up to 2500 yd^3 on-site; dispose of ash residues at a hazardous waste landfill.		1,277,000
	Manage on-site in a temporary waste pile.	745,000	
FACILITY AREA/			
Firewater	Filter asbestos fibers; and	8,400	8,400
	Treat with carbon adsorption process and use as incinerator quench water; or	2,000	-
	Treat with carbon adsorption process and dispose on-site via evapo-transpiration.		2,000
Buildings	No Action at this time; address before or during Phase III RI/FS.	0	0
Vessels	No Action at this time; address before or during Phase III RI/FS.	0	0
SURFACE SOILS/			
Organics	No Action at this time; address with Phase III RI/FS.	0	0
Metals	No Action at this time; address with Phase III RI/FS.	0	0
MONITORING:	No specific actions or associated costs are listed here. In many instances, the monitoring and costs are included in the remedies listed above.		
TOTAL		2,264,000	3,603,200

J. RATIONALE FOR THE SELECTED REMEDY

In this chapter, the technical rationale for the selected remedy will be presented, followed by a discussion of the statutory determinations.

1. TECHNICAL RATIONALE

For this section of the discussion, the information will be presented under the same five-segment structure used previously.

a. SITE ACCESS

EPA believes that the selected remedy will provide protection to human health and the environment while the Phase III RI/FS works on a more complete remedy. This RAA would effectively restrict site access for humans and wildlife. While a number of areas with high contaminant levels in the soils (visibly contaminated soils or "hot spots") have been identified throughout the site, a significant portion of the BWP site remains generally uncharacterized. The potential increased cancer risk from human exposure to soils in uncharacterized areas and "hot spots" would be mitigated through this interim action by deterring inadvertent exposure to these areas. This RAA will provide substantially greater protection from exposure to contaminants than other less costly RAAs.

EPA has also concluded that this RAA would be the only alternative that would both comply fully with ARARs and be consistent with future remedies. This remedy will not interfere with the implementation of the first or future operable units. A security fence around the perimeter of the site would not have to be removed or altered during remedial activities and would continue to serve its designed function through completion of the Phase III RI/FS and the final remedial action.

b. IMPOUNDMENTS

EPA has concluded that the main and secondary impoundments constitute the major source and concentration of contamination at the site, and should be remedied to address these high concentrations of contaminants.

(1) Main and Secondary Impoundment Sludge

Removal and thermal treatment of the impoundment sludge would be a reliable, proven technology for source control and migration management of the major source of contamination at the site, and would be a permanent remedy. It will remove the contamination from contact with the ground water regime and terminate any additional contribution of contamination to the ground water. It is also the most effective way to address the dioxins that are present in the sludge in that those contaminants would be permanently destroyed.

It is the most cost-effective remedy that would assure compliance with ARARs, particulary with Best Demonstrated Available Technology treatment standards for this type of waste. The sludge has a high BTU (approximately 10,000) value and would help keep energy costs down by generating heat during the incineration process.

The selected alternative will be consistent with future remedies in that it will allow removal of visibly contaminated soils as part of the same operable unit. It would also provide the means to conduct a pilot study of on-site soil incineration during the Phase III RI/FS.

As noted previously, BIC recently (after the end of the public comment period) submitted some new data on the viability of bioreclamation of contaminated soils and suggested that this technology could be applied to the impoundment sludge. EPA reviewed these data and concluded that there was insufficient cause to change the remedy for the sludge. The application of the technology to sludge would involve mixing the sludge with less contaminated soils, thereby diluting the contamination to levels in which the microorganisms would be effective. EPA is concerned that this technology has not been proven, and has particular concerns about the fate of the dioxins in the sludge during this process.

(2) Main Impoundment Oil

The selected thermal treatment remedy would assure permanent destruction of the contaminants in the oil, particularly the dioxins. The principal reasons for selecting this remedy over the slightly less costly carbon treatment remedy were the assured destruction of dioxins and the enhanced usability of the carbon system. Using the carbon system for only contaminated water and not for contaminated oils will extend the life the treatment system.

The oil has a high heat value (17,000 BTU) and would also be used as a source of energy during incineration.

As with the impoundment sludge, this remedy would be the most effective way to address the dioxins that are present in the oil in that those contaminants would be permanently destroyed.

(3) Main Impoundment Water

The selected carbon treatment/quench water remedy is a technically feasible and cost-effective approach to elimination of the hazardous substances in this medium.

This RAA would be consistent with future remedies in that it would greatly enhance the ability to address other contaminated water generated on the site in the future by providing a ready means to treat and dispose of the water in a manner that is protective of human health and the environment. This will likely be most applicable to water produced during future decontamination of the buildings and vessels.

(4) Visibly contaminated soils beneath the impoundments

EPA has selected both a thermal treatment remedy (for a volume of 2500 yd^3 or less) and a temporary storage remedy (for a volume greater than 2500 yd^3) for the impoundment soils to assure that the heavily contaminated soils are removed as soon as possible from contact with the ground water regime in the most cost-effective manner and to provide consistency with future remedies.

EPA believes that bioremediation and other related technologies show promise as an effective remedy for soils contamination. However, EPA also believes that significant work in developing these soils remedies needs to be performed during the Phase III RI/FS. No large-scale soils remedies (including incineration or bioremediation) have yet been supported by any pilot study at this site. Those pilot studies are anticipated to be part of the Phase III RI/FS. EPA did not want to unduly influence these future remedy considerations by selecting a large-scale soils treatment process before the pilot study process was completed.

Consequently, EPA is limiting the incineration option of this remedy to only the small volume of soils that would be compatible with the small-scale sludge incinerator. Any commitment at this time to large-scale incineration or biodegradation would establish an on-site plant that would artificially influence the Phase III engineering sensitivity analysis.

The implementation of the temporary waste pile would be based on the fact that volume of material would be too great (more than 2,500 yd^3) to remediate in the small-scale incinerator selected for the sludge and oil. However, the removal of the soils from contact with the ground water regime would terminate any migration of contaminants from these soils into the ground water. This remedy would also allow for pilot studies on the stockpiled visibly contaminated soils during the Phase III RI/FS.

With either thermal treatment or temporary storage of visibly contaminated soils, other (less than visibly) contaminated soils under the impoundments would be exposed for further investigation during the Phase III RI/FS. Hence, either of these remedies would be consistent with future remedies.

c. FACILITY AREA (BUILDINGS, VESSELS, ETC.)

(1) Firewater

EPA believes that removal and treatment of the firewater will permanently address a major source of contamination in the Facilities Area. This remedy will also be consistent with future remedies in that the presence of this water has been a major impediment to addressing the other sources in this area.

(2) Buildings

As noted previously, EPA has concluded that not enough information exists to support selection of a remedy to address the buildings in the facility area. EPA believes that such information could be gathered in a relatively short period of time after this Record of Decision, documented in a either the Phase III RI/FS or a separate study to support a removal action.

(3) Vessels

EPA has also concluded that not enough information exists at this time to support selection of a remedy to address the vessels and their contents. In particular, EPA is concerned that the contents of the vessels need to be characterized better to allow adequate evaluation of treatment remedies. As with the buildings, EPA believes that such information for the vessels could be gathered in a relatively short period of time after this Record of Decision, documented in a either the Phase III RI/FS or a separate study to support a removal action.

d. SURFACE SOILS/with Organics or Metals Contamination

As noted previously, EPA believes that selection of a remedy for the surface soils is not supportable at this time. The full extent of contamination associated with surface soils throughout the site is unknown. Cleanup goals for surface soils at the site have not yet been established. No reliably effective remedy has been identified to meet cleanup goals. It is EPA's intent that the Phase III RI/FS will address these three key issues relating to surface soils.

In the interim, EPA believes that the security fencing selected as part of the first operable unit will effectively limit the potential for human exposure to surface contamination.

e. MONITORING

As noted previously, EPA has concluded that environmental monitoring will be necessary during implementation of the selected remedies to assure that the RAAs successfully reduce or eliminate threats or potential threats to human health and the environment posed by the BWP site. The major purposes of the monitoring program will be to:

a. assure the effectiveness of each specific remedy implemented, and

b. evaluate the overall effect of the operable unit on contaminant migration associated with ground water.

2. STATUTORY DETERMINATIONS

Section 121(b) of CERCLA requires that any selected remedy be protective of human health and the environment, be cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, under Section 121(d) of CERCLA, remedial actions that leave any hazardous substance, pollutant, or contaminant on-site must meet, upon completion of the remedial action, a level or standard of control that at least attains standards, requirements, criteria, or limitations that are legally applicable to the hazardous substance, pollutant, or contaminant concerned, or are relevant and appropriate under the circumstances of the release or threatened release. A remedial action that does not attain such a standard or level of control may be selected only if a statutory waiver is available and determined to be appropriate.

EPA has concluded that the selected remedy is consistent with these requirements of CERCLA as well as with the requirements of the NCP. The basis for this conclusion is found in Chapter F and the accompanying tables (Tables F-1 through F-5). Of particular note is the information in Tables F-5, which evaluates the various remedies against nine criteria that parallel the statutory considerations listed above and discussed in greater detail below. The following section provides a narrative description of how the selected remedy meets the specific statutory requirements:

a. PROTECTIVENESS

EPA's selected remedy, the operable unit at the BWP site, is protective of human health and the environment. To begin with, fencing the entire site, along with posting warning signs, is the most effective option for restricting access to both known and uncharacterized areas of contamination.

For the primary source of contamination, the impoundment sludge, oils and soils, excavation and on-site incineration will provide the greatest degree of protection available for human health and the environment. This protection is achieved because the selected remedy eliminates the primary contamination source from the site, thereby minimizing future releases of contamination from the site and precluding human or animal contact with these contamination sources.

EPA's preferred option for addressing the contaminated impoundment water and firewater is also protective of human health and the environment. Even if EPA's backup remedies for these contaminated waters are determined to be most appropriate during the remedial design phase, there will still be maximum long-term protection of human health and the environment. For example, even the backup remedies will assure that discharged water meets MCLs.

All of the selected remedial options for these contamination sources utilize treatment technologies which will eliminate the contamination source from the site. Finally, implementation of all components of the selected remedy poses no unacceptable short-term risks to human health or the environment.

b. COST EFFECTIVENESS

The selected remedy is a cost effective option for the operable unit at the BWP site. This determination is based on the cost and overall effectiveness of the selected remedy when viewed in light of the cost and overall effectiveness of other alternatives.

For the purpose of evaluating cost effectiveness, the primary component of the selected remedy is on-site incineration of contamination sources. Incineration will provide a permanent remedy to the problems posed by the primary sources of contamination by significantly reducing the toxicity, mobility, and volume of contamination while providing technologically reliable, long-term protection of human health and the environment. Based on information currently available to EPA, no other remedy addressing the primary source of contamination would achieve the same degree of reliable, permanent, overall protection for a lower cost.

The other components of the selected remedy, including the selected options for restricting site access, and treatment of firewater, impoundment water and oils, are also cost effective. For the remedial options chosen for these components of the remedy, the costs are not significantly greater and in some cases are less expensive than the other, less-effective alternatives which were considered (excepting the no-action alternatives). Once again, these components of the remedy provide a high degree of protection at the site, utilizing technologically reliable, permanent remedies which significantly reduce the toxicity, mobility, and volume of contamination on-site.

c. UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

The selected remedy satisfies the statutory preference for utilization of a permanent solution for the sources of contamination addressed in this operable unit. Incineration of contamination sources will significantly and permanently reduce the toxicity, mobility, and volume of the incinerated contaminants. There are no technological barriers to the implementation of the incineration component of the remedy, and once the incineration process is complete, there will be little need for long-term maintenance for this aspect of the selected remedy. The only such maintenance will be associated with the disposal of the residues of the incineration process.

Feasible implementation, significant reduction of TMV, and minimal long-term maintenance are also characteristics of the other components of the selected remedy. Potential remedial options described in the selected remedy for the firewater, impoundment water and oil were selected to achieve the goal of significantly reducing the toxicity, mobility, and volume of the contaminants. Implementability is a key component of the "decision tree" established in the selected remedy, with the options to be chosen during the remedial design phase after it is determined which options can in fact be implemented while at the same time meeting the other selection criteria. Furthermore, all of the selected remedial options require little long-term maintenance.

d. COMPLIANCE WITH ARARs

The selected remedy will comply with all of the ARARs identified for the particular remedial action alternatives which are the components of this operable unit except in one instance in which a backup remedy may not meet ARARs. In that instance in which the remedy may not comply with ARARs, EPA waives the ARAR pursuant to CERCLA section 121(d)(4)(A). This section will describe how the selected remedy complies with ARARs and give the rationale for invoking the statutory waiver.

(1) Site Access

Fencing the entire site complies with the applicable provisions of 6CCR 1004-3 section 264.14. Specifically, section 264.14(b)(2)(i) describes fencing as one of the acceptable alternatives for providing site security at a hazardous waste facility.

(2) K001 Sludge and Impoundment Oils

HSWA requires BDAT treatment of K001 sludge prior to Land Disposal. Incineration will achieve BDAT numbers for the sludge as prescribed in the May 17, 1988 Federal Register and listed elsewhere in this document. Disposal of the ash residues at a licensed hazardous waste landfill is likewise in compliance with HSWA requirements.

(3) Incineration Design and Operation

As noted in the selected remedy description, design and operation of the on-site incinerator will be subject to the requirements set forth in 6 CCR 1007-3 part 264 subpart O.

(4) Treatment and Disposal of Contaminated Water

EPA's first choice for disposal of the contaminated water after treatment by carbon adsorption is to use it as incineration quench water. This option would meet all ARARs in that the water would be evaporated rather than disposed.

If the quench water option is not viable, for instance because of too much quench water, the on-site disposal may be exercised as a second choice. It is possible that carbon adsorption treatment of the contaminated water would achieve non-detectable levels of hazardous constituents. If this is the case, the treated water would no longer be considered hazardous under the State of Colorado's interpretation of 6 CCR section 261.3. Since the water would no longer be considered a hazardous waste, on-site evapo-transpiration would not be subject to any ARARs.

If non-detectable levels are not achieved subsequent to carbon adsorption, the State of Colorado would consider on-site evapo-transpiration as subject to the land treatment requirements of 6 CCR 1007-3 part 264 subpart M. However, EPA will waive the applicable land treatment requirements for this alternative. The basis for this waiver would be that this is an interim remedy, and that any small amount of contamination deposited on the soil would be addressed when the Phase III RI/FS develops remedies for the soils. In any case, as noted previously, the treatment process would still provide a sufficient level of protection in that the treated water would still meet MCLs for drinking water.

(5) Impoundment Soils

Incineration of the impoundment soils should meet ARARs as described for the K001 sludge and impoundment oils. If a waste pile is used to manage the impoundment soils prior to RD/RA which will follow the Phase III RI/FS, the waste pile will be designed consistent with the criteria established in 6 CCR 1007-3 part 264 subpart L.